MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for October, 1900, is based on reports from about 3,099 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Canadian Meteorological Service, 32; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; and Commander Chapman C. Todd, Hydrographer, United States Navy.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′ or $10^h 30^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

The first snow of the season for the eastern part of the country fell in the Adirondack Mountains during the night of the 16th. On the 1st and 2d a severe snowstorm occurred in western Montana. Five to 15 inches of snow fell in the mountain districts of northern Colorado on the 6th, and a snowstorm in the mountains was discernible from Denver, Colo. About the close of the month exceptionally heavy snow was reported along the Alaska and British Columbia coasts.

The first general frost of the season in central and northern districts east of the Mississippi River occurred the night of the 17–18th. The occurrence of this frost was covered by the regular forecasts and by the following special warning which was issued on the morning of the 17th and telegraphed throughout the districts referred to:

Heavy frost will occur to-night from the Ohio Valley and eastern Tennessee over the Atlantic States from Maine to northern North Carolina.

In the upper Mississippi River and tributaries high stages of water prevailed during a great part of the month.

Severe local storms occurred in northern Texas on the 21st.

The most important general storm of the month appeared on the south Atlantic coast on the 12th. From the 13th to the 15th this storm advanced from Hatteras to the Gulf of St. Lawrence attended by gales of marked severity, and during the 16th passed to the north of Newfoundland. On the 16th a disturbance appeared over Nova Scotia, and during the succeeding forty-eight hours this storm moved northeastward over Newfoundland attended by strong gales.

The usual warnings were issued in connection with these storms, and in addition the following special warning was telegraphed on the morning of the 13th to Atlantic coast ports from Portland, Me., to Norfolk, Va.:

Storm off Hatteras will move north and northeast and cause shifting gales beginning from northeast along the transatlantic steamship routes from the American coast to the Banks of Newfoundland, Sunday. Publish on morning map.

SPECIAL FORECASTS.

Special local forecasts for periods greater than thirty-six hours were issued by request of the managers of "street fairs" at Montgomery, Ala., and Fort Smith, Ark., and the value of the forecasts to the interests involved has been acknowledged by the local press. In the case of the Elks Street Fair held at Springfield, Mo., September 3 to 6, inclusive, the executive committee of the fair expressed in a set of resolutions their appreciation of the accuracy and value of the very successful long range forecasts which were furnished by the Weather Bureau.

CHICAGO FORECAST DISTRICT.

The month of October was exceptionally mild throughout the district, and no severe storm crossed the Lake region. As a rule the wind force and direction were correctly forecast.—*H. J. Cox, Professor.*

SAN FRANCISCO FORECAST DISTRICT.

During October this district was visited by four periods of rainy weather: 2d to 4th, 11th and 12th, 18th and 19th, and 27th and 28th. Ample warnings were issued of the approaching rains in each instance. The first rains occurred in the height of the fruit drying season, and the fact that little or no damage resulted is in a measure due to the timely warnings issued by the Weather Bureau.

Storm warnings were observed and no damage to shipping occurred.—*G. H. Willson, Local Forecast Official.*

PORTLAND, OREG., FORECAST DISTRICT.

Comparatively settled weather prevailed in the north Pacific coast States until the morning of the 18th, when a storm was noted approaching Vancouver Island, which not only heralded the beginning of the rainy season, but also the advent of a series of southerly gales that continued almost uninterruptedly throughout the remainder of the month. Storm warnings were displayed and shipping in the different ports were kept fully advised regarding the force and character of the expected storms. With the exception of a maximum wind velocity of 53 miles an hour at Portland on the 19th, no winds of unusual severity were recorded at the Weather Bureau stations in this district. Press reports show, however, that the gales were unusually severe and that vessels exposed to them suffered considerable damage.—*E. A. Beals, Forecast Official.*

HAVANA, CUBA, FORECAST DISTRICT.

No hurricane warnings were displayed during the month; nor were any necessary.—*W. B. Stockman, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Highs.—Of the eight highs, all but one, No. III, moved almost or entirely across the country, and all were above the thirty-fifth parallel. No. V described a somewhat erratic course after reaching central Ontario, dipping down to the North Carolina coast, and from thence turning northeastward along the coast to Cape Breton Island. The movements of the remainder were quite uniform, except that No. VIII, after reaching New Brunswick, and being reinforced by another high from Labrador, turned abruptly to the southward and was last noticed at the Island of Bermuda. No. III was a very moderate area, which moved up the Ohio Valley and disappeared in a single day.

From the 1st to the 5th the pressure was high on the middle Atlantic and New England coasts, and on the morning of the 5th another high appeared over the Gulf of St. Lawrence. It spread southward over New Brunswick and New England, causing general though mostly light rains, and continued to develop strength until the morning of the 7th, after which time it slowly dissipated as a low approached from the west.

Lows.—The movements of the fifteen lows were extremely erratic, and were remarkable for the fact that none was over the eastern half of the country south of Canada, except three of tropical origin, Nos. III, V, and X, that passed up the Atlantic coast. The majority originated either in the British Northwest or first appeared on the north Pacific coast. The paths, as a rule, were quite short, only three, Nos. II, VI, and XIV, moving across the country. When No. IX passed beyond the field of observation to the northward of Lake Superior it was the combination of three different sections that had originated, one in Alberta, one in western South Dakota, and the third in the Texas panhandle. The two latter sections merged into one in the middle Missouri Valley, to be joined two days later by the first section over northwestern Lake Superior. No. X was a tropical disturbance of moderate energy, which was first noted on the morning of the 23d over the southern portion of the Windward Islands. It moved very slowly northwestward to the Bahamas, and then recurved to the northeastward. It was finally noted while passing Bermuda. Another tropical disturbance, No. V, originated over southeastern Cuba, moved northwestward off the west Florida coast, and then turned northward along the coast to Maine, finally passing out beyond the Gulf of St. Lawrence. No. III was first observed at Bermuda; moved northwestward to the Massachusetts coast, and thence northeastward along the coast to Cape Breton Island. Nos. VII, VIII, XII, and XV originated on or near the north Pacific coast and dissipated in from twenty-four to thirty-six hours in the British Northwest.

There was a low, which was not charted, over the west Gulf of Mexico from the morning of the 4th to the evening of the 5th. It was evidently a tropical disturbance of minor character that moved in from the Caribbean Sea. There was also a stationary depression over the middle and northern Plateaus and Pacific coast from the morning of the 1st to the evening of the 4th, and another over the south Pacific coast and southern Plateau from the morning of the 9th to the morning of the 11th. During the 11th the latter moved to the middle California coast and disappeared.

There were lows over the British Northwest from the evening of the 10th to the evening of the 13th, and from the morning of the 23d to the morning of the 26th. The former began to move eastward during the night of the 13th, and is charted as No. VI.—*H. C. Frankenfield, Forecast Official.*

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days*	*Miles.*	*Miles.*
I	6, a. m.	51	114	9, p. m.	48	68	3,095	3.5	884	36.8
II	8, a. m.	43	110	14, a. m.	46	60	3,125	6.0	521	21.7
III	14, a. m.	35	90	15, a. m.	38	80	650	1.0	650	27.1
IV	14, p. m.	51	114	18, a. m.	38	80	1,825	3.5	521	21.7
V	17, a. m.	53	109	24, a. m.	46	60	3,425	7.0	489	20.4
VI	23, a. m.	44	116	26, a. m.	45	64	2,625	3.0	875	36.5
VII	23, p. m.	41	124	28, p. m.	46	60	3,625	5.0	725	30.2
VIII	26, a. m.	46	123	2, p. m.†	32	65	3,950	7.5	527	22.0
Sums							22,320	36.5	5,192	216.4
Mean of 8 paths							2,790		649	27.0
Mean of 36.5 days									612	25.5
Low areas.										
I	30, a. m.*	44	116	2, a. m.	41	96	1,100	2.0	550	22.9
II	4, p. m.	45	123	8, a. m.	49	68	2,825	3.5	807	33.6
III	10, a. m.	32	65	11, p. m.	46	60	1,350	1.5	900	37.8
IV	8, p. m.	54	114	11, a. m.	48	89	1,125	2.0	562	23.4
V	10, a. m.	20	76	15, p. m.	49	68	2,700	5.5	491	20.5
VI	14, a. m.	45	110	18, a. m.	48	54	2,900	4.0	725	30.2
VII	18, a. m.	50	120	19, a. m.	51	104	825	1.0	825	34.4
VIII	19, a. m.	45	123	20, p. m.	53	105	1,175	1.5	784	32.6
	20, a. m.	44	103				1,175	3.0	392	16.3
IX	20, p. m.	35	102	23, a. m.	48	89	1,250	2.5	500	20.8
	21, a. m.	54	114				1,400	2.0	700	29.2
X	23, a. m.	15	62	30, a. m.	32	65	2,150	7.0	307	12.8
XI	24, a. m.	46	106	27, a. m.	43	77	2,125	3.0	708	29.5
XII	27, a. m.	49	123	28, a. m.	54	114	550	1.0	550	22.9
XIII	27, a. m.	44	103	28, p. m.	48	87	1,050	1.5	700	29.2
XIV	28, p. m.	38	114	3, a. m.†	48	54	3,445	5.5	626	26.1
XV	30, a. m.	49	123	31, p. m.	53	108	720	1.5	480	20.0
Sums							27,865	48.0	10,606	442.2
Mean of 17 paths							1,639		624	26.0
Mean of 48 days									580	24.2

* September. † November.

RIVERS AND FLOODS.

Good boating stages continued over the larger navigable rivers except the upper Tennessee, where low water necessitated a suspension of navigation during much of the month. Navigation on the upper Mississippi was practically suspended after the middle of the month despite the fact that there was ample water for all the business.

The principal occurrence of interest during the month was a flood of considerable proportions over the Wisconsin tributaries of the Mississippi River, due to excessive rains over that district. At La Crosse, Wis., 7.23 inches of rain fell during the twenty-four hours ending at 8 a. m. of the 28th, and heavy rains had also occurred during the early days of the month. Great damage was wrought by the high waters in the Chippewa, Black, and Wisconsin rivers, and the total losses reported are said to have exceeded $100,000. Streets in towns were flooded, families driven from their homes, stock drowned, crops ruined, and railroads washed out, but very fortunately, no lives were lost. At Portage, Wis., on the 9th, the Wisconsin River reached 12.5 feet on the gage, the highest known stage, and the lowlands for five or six miles around, were from four to six feet under water. The Government levee at Portage gave way and the lower portions of the city were flooded in a very few minutes.

The upper Mississippi also rose rapidly from these accretions, and damage, mostly of a minor nature, was reported as far south as the vicinity of Davenport, Iowa. No danger-line stages were reached along the Mississippi, although they were closely approached from La Crosse to Dubuque.

The lower Ohio system was somewhat affected by an outflow through the Great Kanawha River from the New River. Heavy rains occurred on the 23d and 24th over the watershed of the latter, and at Radford, Va., a stage of 22 feet, or 8 feet above the danger line, was reached on the 24th, being a rise of 21.6 feet in twenty-four hours. At Hinton, W. Va., there was a rise of nearly 11 feet. Warnings were sent to localities interested, and they were very instrumental in saving insecure floating property. In the Ohio River there was a rise of from five to eight feet from Portsmouth, Ohio, to Madison, Ind. It did not extend below Louisville until after the close of the month.

The highest and lowest water, mean stage, and monthly range at 129 river stations are given in Table XI. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches and temperature in degrees Fahrenheit.

Alabama.—The mean temperature was 68.8°, or 5.4° above normal; the highest was 98°, at Pushmataha on the 1st, and the lowest, 44°, at at Valley Head on the 12th and at Riverton on the 19th The average precipitation was 5.64, or 3 37 above normal; the greatest monthly amount, 11.42, occurred at Riverton, and the least, 2.30, at Pineapple. —*F P. Chaffee.*

Arizona.—The mean temperature was 65.0°, or 0.8° below normal; the highest was 102°, at Blaisdell on the 8th and at Parker on the 9th, and the lowest, 11°, at Flagstaff on the 30th and 31st. The average precipitation was 0.48, or 0.52 below normal; the greatest monthly amount, 1.60, occurred at Strawberry, while none fell at Pantano, Sentinel, and Tombstone.—*L. M. Dey, Jr.*

Arkansas.—The mean temperature was 66.0°, or 4.2° above normal; the highest was 97°, at Camden on the 6th, and the lowest, 32°, at Ione on the 10th. The average precipitation was 4.31, or 1.95 above normal; the greatest monthly amount, 8.43, occurred at Spielerville, and the least, 1.19, at Brinkley.

The rains and warm weather caused some cotton to rot and sprout in the bolls, and picking was pushed as rapidly as the weather permitted. Wheat sowing was delayed during the early part of the month on account of the ground being too hard and dry for plowing, but the general rains later put the ground into better condition for plowing, and sowing of wheat became more general and progressed satisfactorily.—*E. B. Richards.*

California.—The mean temperature was 58.8°, or 1.6° below normal; the highest was 107°, at Raymond on the 13th, and the lowest, 1°, at Bodie on the 30th. The average precipitation was 2.37, or 1.22 above normal; the greatest monthly amount, 15.68, occurred at Delta, while none fell at 7 stations.—*A. G. McAdie.*

Colorado.—The mean temperature was 49.7°, or more than 3.0° above normal; the highest was 92°, at Holly on the 5th, and the lowest, 1° below zero, at Breckenridge on the 30th. The average precipitation was 0.68, or 0.34 below normal; the greatest monthly amount, 5.00, occurred at Twin Lakes, while none fell at several stations.—*F. H. Brandenburg.*

Florida.—The mean temperature was 75.7°, or 2.5° above normal; the highest was 95°, at De Funiak Springs on the 1st and at Hypoluxo and Ocala on the 8th, and the lowest, 49°, at Jasper on the 19th. The average precipitation was 5.49, or 0.99 above normal; the greatest monthly amount, 14.10, occurred at Hypoluxo, and the least, 2.13, at Archer.—*A. J. Mitchell.*

Georgia.—The mean temperature was 68.7°, or 4.7° above normal; the highest was 97°, at Thomasville on the 1st, and the lowest, 38°, at Dahlonega on the 18th. The average precipitation was 4.12, or 1.44 above normal; the greatest monthly amount, 9.64, occurred at Valona, and the least, 1.27, at Macon.

It was the warmest October on record since the establishment of the voluntary observation service in the State, in 1891. The weather conditions were generally favorable for fall plowing and seeding.—*J. B. Marbury.*

Idaho.—The mean temperature was 46.5°, or 1.1° above normal; the highest was 87°, at Hagerman on the 16th, and the lowest, 5°, at Chesterfield on the 27th. The average precipitation was 2.27, or 0.69 above normal; the greatest monthly amount, 5.07, occurred at Priest River, and least, 0.52, Lost River.—*S. M. Blandford.*

Illinois.—The mean temperature was 62 0°, or 7.2° above normal; the highest was 93°, at Hallidayboro on the 1st, at Cobden on the 2d, 3d, and 4th and at St. John on the 4th; the lowest, 23°, at Lanark on the 17th. The average precipitation was 2.47, or 0.25 above normal; the greatest monthly amount, 4.70, occurred at La Harpe, and the least, 0.73, at Halfway.

The month was very favorable for the advancement of fall farm work, and in many localities it was brought almost to completion. Corn matured and large quantities husked and cribbed. The seeding of wheat and rye was practically finished, and the excellent condition of the ground brought them generally to a good stand.—*M. E. Blystone.*

Indiana.—The mean temperature was 61.9°, or 7.9° above normal; the highest was 96°, at Paoli on the 5th, and the lowest, 26°, at Fairmount on the 17th. The average precipitation was 2 56, or 0.18 above normal; the greatest monthly amount, 5.50, occurred at Rockport, and the least, 0.50, at Valparaiso.

Warm, dry weather was very favorable for farm work; wheat sowing was completed, and, although the ground was dry in many fields, it germinated well, and at the end of the month had come up nicely and the fields looked green. Corn ripened well and was gathered in good condition.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 59.3°, or 9.0 above normal; the highest was 90°, at Bedford on the 3d and 4th and at Toledo on the 4th, and the lowest, 21°, at Plover on the 14th. The average precipitation was 3.91, or about 1.63 above normal; the greatest monthly amount, 8.00, occurred at College Springs, and the least, 1.20, at Sibley.

The pastures are extra good, affording more than the usual amount of fall feed for stock, and fall sown wheat and rye, though limited in

area, have made an excellent stand are well prepared to withstand the coming winter.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 61.5°, or 5.3° above normal; the highest was 97°, at Achilles on the 3d, and the lowest, 22°, at Tribune and Wallace on the 31st. The average precipitation was 2.68, or 0.57 above normal; the greatest monthly amount, 5.71, occurred at Wichita, and the least, 0.03, at Tribune.

Wheat sowing is nearly completed, except in the extreme western counties, and wheat is coming up and growing rapidly, the early sown being so high that farmers have begun to pasture it to prevent stooling. —*T. B. Jennings.*

Kentucky.—The mean temperature was 64.5°, or 5.7° above normal; the highest was 94°, at Bardstown and Paducah on the 3d, and the lowest, 29°, at Catlettsburg on the 18th. The average precipitation was 2.29, or 0.15 above normal; the greatest monthly amount, 6.78, occurred at Hopkinsville, and the least, 0.57, at Shelby City.

The weather was generally favorable for farm work; some localities complain of drought, and more rain would be of benefit. Probably a little less than the usual amount of wheat was sown; some early sown shows signs of the hessian fly, but the late appears to be free.—*H. B. Hersey.*

Louisiana.—The mean temperature was 71.3°, or 3.9° above normal; the highest was 103°, at Lake Charles on the 2d, and the lowest, 40°, at Robeline on the 10th. The average precipitation was 3.76, or 1.06 above normal; the greatest monthly amount, 10.50, occurred at Lake Charles, and the least, 1.50, at Mansfield.

At the close of the month most of the fall plowing and planting and some windrowing had been done, but generally sugar planters were waiting for cooler weather to windrow seed cane for spring planting. The condition of fall gardens and the products of truck farms improved during the latter part of the month.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 60.6°, or 6.2° above normal; the highest was 91°, at Hancock, Md., on the 5th and 6th, and the lowest, 20°, at Deerpark, Md., on the 18th. The average precipitation was 2.11, or 0.92 below normal; the greatest monthly amount, 5.30, occurred at Milford, Del., and the least, 1.10, at Woodstock College, Md.—*Oliver L. Fassig.*

Michigan.—The mean temperature was 56.6°, or 8.0° above normal; the highest was 90°, at Ovid and Owosso on the 5th and 6th, and the lowest, 19°, at Baldwin on the 17th. The average precipitation was 2.71, or 0.05 below normal; the greatest monthly amount, 5.12, occurred at Menominee, and the least, 0.52, at Newberry.—*C. F. Schneider.*

Minnesota.—The mean temperature was 55.1°, or 8 8° above normal; the highest was 86°, at Jennie on the 2d, and the lowest, 17°, at New Folden on the 7th. The average precipitation was 3.85, or 1.59 above normal; the greatest monthly amount, 11.35, occurred at St. Charles, and the least, 0.71, at Milaca.

A considerable area of rye was sown, with excellent soil conditions, and it germinated well, ensuring a good stand.—*T. S. Outram.*

Mississippi.—The mean temperature was 69.0°, or 4.4° above normal; the highest was 97°, at Brookhaven on the 1st and 2d, and the lowest, 38°, at Brookhaven on the 13th. The average precipitation was 5.46, or 3.39 above normal; the greatest monthly amount, 12.23, occurred at Water Valley, and the least, 2.35, at Bay St. Louis.—*W. S. Belden.*

Missouri.—The mean temperature was 62.3°, or 5.8° above normal; the highest was 92°, at Louisiana on the 4th, and the lowest, 25°, at Ironton on the 18th. The average precipitation was 4.24, or 1.91 above normal; the greatest monthly amount, 8.38, occurred at Miami, and the least, 1.33, at Nevada.

In portions of the central and western sections heavy rains on the 1st and 2d, 6th and 7th, and 21st and 22d prevented corn from drying out sufficiently for gathering; otherwise the weather, up to the 27th, was all that could be desired for securing outstanding crops and for the seeding and germination of fall grains.—*A. E. Hackett.*

Montana.—The mean temperature was 45.6°, or 0.9° above normal; the highest was 98°, at St. Pauls on the 24th, and the lowest, 5°, at Kipp on the 4th and 6th. The average precipitation was 1.21, or 0.31 above normal; the greatest monthly amount, 3.42, occurred at Columbia Falls, and the least, 0.02, at Chester and Clemons—*E. J. Glass.*

Nebraska.—The mean temperature was 56.7°, or 6.3° above normal; the highest was 100°, at Culbertson on the 5th, and the lowest, 19°, at Kennedy on the 11th. The average precipitation was 2.08, or 0.52 above normal; the greatest monthly amount, 7.55, occurred at Eden, while none fell at several stations in the southwestern portion.

The weather was exceptionally favorable for the germination and growth of fall sown grain. The total acreage of winter wheat sown is unusually large, and the crop is in exceedingly fine condition—*G. A. Loveland.*

Nevada.—The mean temperature was 47.7°, or about 1.3° below normal; the highest was 82°, at Candelaria on the 9th, 15th, and 16th, and the lowest, 4°, at Hamilton and Palmetto on the 30th. The average precipitation was 0.80, or about 0.31 above normal; the greatest monthly amount, 4.06, occurred at Lewers Ranch, while none fell at several stations.—*J. H. Smith.*

New England.—The mean temperature was 53.9°, or 5.8° above normal; the highest was 85°, at several stations on the 5th and 6th, and the lowest, 15°, at several stations on different dates. The average precipitation was 3.65, or nearly normal; the greatest monthly amount, 8.26, occurred at Eastport, Me., and the least, 1.59, at New London, Conn.

Fall operations on the farm have progressed under most favorable circumstances, and farmers, as a rule, are well prepared for the winter now at hand.—*J. W. Smith.*

New Jersey.—The mean temperature was 59.9°, or 6.0° above normal; the highest was 92°, at Layton and Vineland on the 6th, and the lowest, 19°, at Layton on the 20th. The average precipitation was 3.70, or nearly normal; the greatest monthly amount, 6.59, occurred at Bridgeton, and the least, 1.47, at Layton.

Favorable weather conditions prevailed during the month, and fall seeding was completed early in the month, and an exceptionally good stand of wheat, rye, and grass, obtained by the 20th.—*E. W. McGann.*

New Mexico.—The mean temperature was 54.6°, or 1.1° above normal; the highest was 91°, at Mesilla Park on the 5th, and the lowest, 10°, at Aztec on the 31st. The average precipitation was 1.07, or 0.13 below normal; the greatest monthly amount, 3.33, occurred at Roswell, and the least, 0.10, at Cambray.—*R. M. Hardinge.*

New York.—The mean temperature was 55.9°, or 7.8° above normal; the highest was 94°, at Auburn on the 6th, and the lowest, 16°, at South Kortright on the 20th. The average precipitation was 3.05, or 0.13 above normal; the greatest monthly amount, 5.94, occurred at Bolivar, and the least, 1.00, at Plattsburg.

The weather was unusually favorable for the harvest of all outstanding crops; the conditions were generally favorable for the seeding and germination of fall grain, and at the close of the month winter wheat and rye were very fine, and pastures in many sections were fresh and green, probably affording more feed for stock than at any time during the summer.—*R. G. Allen.*

North Carolina.—The mean temperature was 64.4°, or 4.8° above normal; the highest was 94°, at Tarboro on the 6th, and the lowest, 29°, at Monroe and Selma on the 18th. The average precipitation was 3.14, or 0.55 below normal; the greatest monthly amount, 13.40, occurred at Linville, and the least, 0.47, at Selma.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 48.2°, or 6.2° above normal; the highest was 87°, at Dunseith on the 17th, and the lowest, 14°, at Medora on the 30th. The average precipitation was 1.54, or 0.35 above normal; the greatest monthly amount, 3.03, occurred at Amenia, and the least, 0.26, at Woodbridge.—*B. H. Bronson.*

Ohio.—The mean temperature was 60.5°, or 8.0° above normal; the highest was 93°, at Dayton on the 3d and 5th and at Thurman on the 5th, and the lowest, 23°, at Garrettsville on the 20th. The average precipitation was 1.89, or 0.22 below normal; the greatest monthly amount, 5.21, occurred at Sidney, and the least, 0.88, at Shenandoah.

The weather was favorable for the growth of wheat, except in some central and southern counties, where it was too dry. The seeding was generally later than usual, and in a few counties in the southern portion is not yet completed.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 65.0°, or 2.4° above normal; the highest was 95°, at Colbert and Healdton on the 4th and at Taloga on the 5th, and the lowest, 33°, at Clifton on the 8th, at Prudence on the 9th and 10th, and at Jenkins on the 11th. The average precipitation was 3.73, or 1.01 above normal; the greatest monthly amount, 7.55, occurred at Telequah, and the least, 0.97, at Woodward.

Farm work progressed rapidly, and cotton picking and corn husking were well advanced. The weather was very favorable to the development of wheat, rye, and grass, which made good growth and were in excellent condition at the close of the month.—*C. M. Strong.*

Oregon.—The mean temperature was 50.2°, or 1.6° below normal; the highest was 87°, at Prineville on the 17th, and the lowest, 14°, at Vale on the 27th. The average precipitation was 5.71, or 2.49 above normal; the greatest monthly amount, 16.04, occurred at Glenora, and the least, 1.05, at Riverside.—*E. A. Beals.*

Pennsylvania.—The mean temperature was 58.6°, or 7.7° above normal; the highest was 95°, at Irwin on the 7th, and the lowest, 19°, at Dushore and Dyberry on the 20th. The average precipitation was 2.74, or 0.80 below normal; the greatest monthly amount, 5.10, occurred at Smethport, and the least, 0.80, at Ephrata.—*L. M. Dey.*

South Carolina.—The mean temperature was 67.6°, or 5.3° above normal; the highest was 95°, at Blackville on the 1st, and the lowest, 33°, at Cheraw and Santuc on the 18th. The average precipitation was 3.65, or 0.52 above normal; the greatest monthly amount, 8.44, occurred at Smiths Mills, and the least, 1.79, at Florence.

The weather was favorable for maturing outstanding crops, and for seeding fall grains.—*J. W. Bauer.*

South Dakota.—The mean temperature was 53.6°, or about 6° above normal; the highest was 97°, at Chamberlain on the 13th, and the lowest, 10°, at Rochford on the 31st. The average precipitation was 1.68, or about 0.61 above normal; the greatest monthly amount, 3.90, occurred at Alexandria, and the least, 0.14, at Farmingdale—*S. W. Glenn.*

Tennessee.—The mean temperature was 64.7°, or 5.6° above normal; the highest was 92°, at McMinnville on the 2d, and the lowest, 34°, at Silverlake on the 18th. The average precipitation was 4.22, or 1.66 above normal; the greatest monthly amount, 8.06, occurred at Johnsonville, and the least, 1.22, at Jonesboro.

The weather was fine for all outdoor work, and vegetation generally remained green to the end of the month.—*H. C. Bate.*

Texas.—The mean temperature was 70.3°, or 2.2° above normal; the highest was 101°, at Camp Eagle Pass on the 5th and at Fort McIntosh on the 6th, and the lowest, 34°, at Menardville on the 10th. The average precipitation was 3.30, or 1.06 above normal; the greatest monthly amount, 7.10, occurred at Wichita Falls, and the least, 1.15, at Waco.

Conditions being favorable, corn gathering was prosecuted with vigor. The quality of the crop was not all that could be desired, much of it being reported damaged either by weevil or rain. The yield, as a whole, was considerably below the average.

Cotton picking was rushed during the month, advantage being taken of the favorable conditions. This work was somewhat delayed during the third decade by the rainy weather. There were scattered complaints of the scarcity of pickers. Notwithstanding this, the work was well advanced, and the close of the month found the crop practically picked, except over the northern and western portions. The crop was generally below the average in amount, having been injured to some extent by worms and other pests, and also by the hurricane which swept over the State on September 8 and 9.

Wheat sowing was general during the month, the work being somewhat delayed by the rainy weather toward the last of the month. Early-sown wheat came up nicely. The month closes with weather favorable for germination of seed in the ground.

Fall gardening along the coast progressed fairly well, the showers during the third week of the month proving very beneficial.—*I. M. Cline.*

Utah.—The mean temperature was 48.9°, or 0.4° above normal; the highest was 95°, at Pinto on the 1st, and the lowest, 1° below zero, at Loa on the 29th. The average precipitation was 0.89, or 0.03 below normal; the greatest monthly amount, 2.88, occurred at Huntsville, while none fell at Castle Dale and Wellington.—*L. H. Murdoch.*

Virginia.—The mean temperature was 61.9°, or 5° above normal; the highest was 93°, at Barboursville on the 6th, and the lowest, 26°, at Meadowdale on the 17th and at Burke's Garden on the 18th. The average precipitation was 3.01, or 0.22 below normal; the greatest monthly amount, 5.46, occurred at Clifton Forge, and the least, 0.95, at Callaville.

The weather was favorable for farm work and for the germination of seed.—*E. A. Evans.*

Washington.—The mean temperature was 48.9°, or 0.3° below normal; the highest was 82°, at Colfax on the 16th, and the lowest, 20°, at Centerville on the 7th. The average precipitation was 4.75, or 2.24 above normal; the greatest monthly amount, 17.64, occurred at Clearwater, and the least, 0.48, at Connell.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 60.9°, or 6.2° above normal; the highest was 96°, at Byrne on the 7th, and the lowest, 24°, at Philippi on the 18th. The average precipitation was 2.33, or 0.26 below normal; the greatest monthly amount, 4.80, occurred at Lewisburg, and the least, 1.15, at Martinsburg.

The weather was favorable for farm work, and in well-prepared ground wheat is coming up nicely and is in fairly good condition.—*E. C. Vose.*

Wisconsin.—The mean temperature was 56.4°, or 8.1° above normal; the highest was 91°, at Watertown on the 3d, and the lowest, 10°, at Barron on the 8th. The average precipitation was 5.92, or 3.54 above normal; the greatest monthly amount, 12.09, occurred at La Crosse, and the least, 1.87, at Racine.—*W. M. Wilson.*

Wyoming.—The mean temperature was 46.5°, or 2.0° obove normal; the highest was 90°, at Cody on the 12th, and the lowest, 8°, at Bittercreek on the 30th. The average precipitation was 0.58, or 0.23 below normal; the greatest monthly amount, 1.81, occurred at South Pass City, while none fell at Hyattville.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

LIGHTNING FROM A CLOUDLESS SKY.

By B. S. PAGUE, Local Forecast Official, Detroit, Mich., dated October 5, 1900.

I was much interested in the report of J. N. Weed, of Newburg, N. Y., concerning lightning from a cloudless sky and the comments thereon, as published on pages 292 and 293 of the MONTHLY WEATHER REVIEW for July, 1900. A few hours after reading the report and the comments I had the opportunity to observe lightning from a cloudless sky. The circumstances were as follows: On October 4, 1900, the weather map showed conditions somewhat favorable for thunderstorms over the greater portion of upper and lower Michigan and over the surrounding region; the local forecast for Detroit was for fair weather; during the afternoon of October 4, owing to dark appearing clouds in the southwest, it looked as though a thundershower might occur in this vicinity before midnight. The clouds kept well to the south and were of the cumulus form. About 5 o'clock rain apparently was falling over in Canada about 10 miles south and southeast of this station. As sunset approached the clouds disappeared from the horizon, except on the south and southeast sides. About 7:45 p. m. (local, sun time) I started on a bicycle, riding out Woodward avenue, which is in a straight line northwestward from the thunder and lightning then prevailing over in Canada. After riding about thirty minutes, and being then about 15 miles from where the thunderstorm was in progress, I observed flashes of lightning. The evening was nearly calm, the temperature very pleasant, and not a cloud was observed in the sky. After riding about two miles more I dismounted and looked carefully for clouds, but none were visible. Lightning was very distinct in the south and east; with my back to the place whence I knew the lightning came, I could see overhead flashes of lightning, in the form of sheets, which, like Mr. Weed, I would characterize as of rather delicate type. It continued and increased, waxing and waning. The lightning occurred at frequent intervals all along the horizon from the south to the southeast, with flashes overhead. Returning to my residence I was then facing and riding toward the horizon whence came the distant flashes; after riding about four miles I was in a position to see what appeared to be a long streak of clouds extending from the main body northwestward; from this extended cloud the lightning appeared to come.

Now, had I not known that a thunderstorm was prevailing over in Canada and had I observed the lightning only from my most distant point (about 17 miles) from the storm I should have maintained with apparent correctness that the lightning was from a cloudless sky. This occurrence of lightning from an apparently cloudless sky reminds me of rain from a cloudless sky, which I observed in Oregon a short time ago. The rainfall, as I discovered within an hour afterward, was from a cloud at some distance in the southwest, not seen where I saw and felt the rain; the rain occurred about 9 p. m.; the sky was clear, but going on my wheel about three miles toward the southwest I saw the cloud from which the rain fell; the wind had carried the rain to the place where I observed it.

Returning now to Mr. Weed's report he states first at 7:30 a light wind "mere breathings;" at 9 p. m. a sudden gust and "some minutes later succeeded by another gust of more force." The gusts then came more frequently and "soon developed into a cold, gusty wind." He then states:

> Our horizon in the northeast quadrant is low. In the southeast, limited by mountain crests from 4 to 7 miles distant, and ranging from 1,000 to 1,600 feet high. Beyond this horizon are a succession of other mountains hidden from our view, with deep valleys between, including the Valley of the Hudson River. The night was cloudless until the wind came. Soon after this a few cloudlets of stratus formed near the north end of the mountains, say east-northeast, near the horizon, but disappeared before the appearance of the phenomena I am about to mention. At the moment of the rising of Fomalhaut above the mountains southeast we noticed a gleam of lightning, of rather delicate type, just to the left of the star and back of the mountains.

The lightning continued until they left, about 1 a. m.

> The lightning occurred at frequent intervals all along the horizon from the point of origin to near the east point and was undoubtedly true lightning.

The experience of Mr. Weed was the same as mine, with

this difference, I knew a thunderstorm was prevailing beyond my night horizon and he did not. It is well known that the night horizon of an observer is much less than it is in day time, and this I think accounts for the lightning from a cloudless sky as well as for rain from a cloudless sky, both phenomena being reported, as a rule, as having been observed at night. Mr. Weed reports the mountains southeast of his location, and the appearance of clouds about the north end of the mountain and the lightning left of the star and back of the mountains; this places the mountains in the southeast, the lightning east-southeast, and the clouds east and east-northeast; the wind was from the northeast, hence the clouds were evidently driven east of the mountain summits southward, causing the clouds to be beyond the night horizon of Mr. Weed and further, hid by the mountain peaks, so that the clouds should be about where the lightning came from; the lightning flashed upward and could be plainly seen while the clouds were below the horizon or behind the peaks. The description which Mr. Weed gives of the wind indicates also the possibility of a slight disturbance, possibly a local thunderstorm of mild intensity. It is well known that local storms, especially thunder squalls or storms, occur even when the weather map shows no signs of it.

MONTHLY STATEMENT OF AVERAGE WEATHER CONDITIONS FOR OCTOBER.

By Prof. E. B. GARRIOTT.

The following statements published on October 1, are based on average weather conditions for October as determined by long series of observations. As the weather of any given October does not conform strictly to the average conditions, the statements can not be considered as forecasts:

In October the storms of the middle latitudes of the north Atlantic Ocean become more frequent and severe and the winds are more pronounced in force and hold more steadily from westerly quarters.

The season of West Indian hurricanes terminates frequently with storms of maximum seasonal severity, and the severer storms are usually experienced in Cuba and the Bahamas. In Porto Rico and the Lesser Antilles storms are less frequent than in August and September. In the Philippine Islands and along the southeastern coasts of Asia typhoons occur less frequently than during September and the late summer months.

In October the wet season begins on the Pacific coast of the United States and rain becomes more general over the middle and northern Plateau regions. In the Rocky Mountain districts and Arizona October rains are light as compared with those of the summer months. Over the country generally from the Rocky Mountains to the Mississippi River there is a diminution of rainfall from June to December. East of the Mississippi the total precipitation averages less than for the summer months, but is more evenly distributed in the form of general rains.

Damaging frost is likely to occur in the United States in October as far south as the interior of the Gulf and South Atlantic States.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made partly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological observations at Honolulu, October, 1900.

The station is at 21° 18′ N., 157° 50′ W.

Hawaiian standard time is 10^h 30^m slow of Greenwich time. Honolulu local mean time is 10^h 31^m slow of Greenwich.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local or 7:31 p. m., Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2:29 a. m., Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.92	70	68	85	69	67.5	75	ssw-w.	1-0	3-0	29.96	29.86	0.00
2	29.95	76	71.5	87	70	68.5	75	sw-nne.	1-2	3	30.01	29.89	0.26
3	29.95	76	68.5	83	75	66.5	70	ne.	1-4	5	30.02	29 93	0.01
4	29 95	75	68	83	75	65.5	65	ne.	3	6	30.02	29.94	0.18
5	29.97	75	68	83	70	65.0	65	nne.	4	4	30.03	29.95	0.08
6	29.92	72	67.5	82	72	64.5	66	ne.	3-0	5-8	30.01	29.93	0.09
7	29.85	71	67.5	83	70	66.0	71	ne.	2	5	29.94	29.86	0.07
8	29 84	68	66.5	84	70	66.0	72	ne.	1-0	1	29.91	29 81	0.00
9	29.86	72	69	83	68	66.7	74	sw.	1-0	2-9	29.92	29.83	0.01
10	29.90	70	68.5	84	71	67.5	73	sw-ne.	1-2	2-10	29.94	29.87	0.20
11	29.91	75	71.5	83	70	69.5	80	s.	1	3-8	29.97	29.89	0.00
12	29.90	77	71.5	87	83	70.3	73	se-ne.	0-2	7-3	29.98	29.88	0.00
13	29.86	72	69	85	76	69.3	70	ne.	1-3	4	29.93	29.86	0.00
14	29.81	70	67	85	71	68.0	74	nne.	3	3-7	29.90	29.81	0.06
15	29.85	66	63.5	84	69	63.7	65	nne.	1	1-0	29.88	29.78	0.00
16	29.89	76	70	84	65	63.5	67	w-nne.	2-0	1-2	29.94	29.84	0.00
17	29.94	77	72	84	76	69.0	77	nne.	2-0	4-10	30.02	29.92	2.68
18	30.04	77	71.5	82	68	70.3	78	ne.	3	10-6	30.06	29.96	0.13
19	30.07	76	69.5	83	75	68.5	71	ne.	3	10-8	30.11	30.04	0.07
20	30 01	76	69	82	74	65.7	66	ne.	4-2	5-3	30.11	30.01	0.00
21	29.98	73	69	83	76	67.0	68	ne.	3	4	30.04	29.95	0.54
22	29.97	75	70	79	71	67.0	75	ne.	2-5	10-6	30.03	29.96	0.81
23	29.99	77	69	80	70	68.3	73	ne.	3	7	30.04	29.96	0.17
24	29.99	76	69	80	74	66.7	70	ne.	4	7-10	30.06	29.97	0.36
25	29.99	76	70	80	71	67.3	74	ne.	3-5	8-3	30.04	29 97	0.26
26	29.96	76	69	81	72	67.0	71	ne.	3-5	4	30.03	29.94	0.17
27	29.96	75	69	79	72	66.3	69	ne.	3-5	6	30.03	29.95	0.15
28	30.00	74	69	80	73	66.0	69	ne.	4-5	7	30.06	29.98	0.09
29	30.00	75	69	80	74	66.7	72	ne.	3-5	7	30 07	30.00	0.15
30	29.96	76	68.5	81	71	65.7	67	ne.	5-6	4-2	30.06	29.95	0.11
31	29.94	75	69.5	81	72	65.7	69	ne.	5	4	30.02	29.94	0.23
Sums	......	......	......	.....	.....	.....	.....	....	.....	.....	......	.....	....
Means	29.953	74.0	69.0	82.4	71.8	66 9	71.0	....	2.7	5.2	.....	.....	6.88
Departure	—.006	......	......	.....	.....	+0.7	0.0	....	.....	+0.9	......	......	+4.42

Mean temperature for October, 1900 (6 + 2 + 9) ÷ 3 = 76.9; normal is 76.3. Mean pressure for October (9 + 3) ÷ 2 is 29.960; normal is 29.966.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) ÷ 4. § Beaufort scale.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Nature. London. Vol. 62.

MacDowall A. B. Sunspots and Frost. P. 599.

Ciel et Terre. Bruzelles. 21*me année.*

Arctowski, H. Sur les conditions météorologiques des régions antarctiques. P. 379.

Polis, P., et Sieberg, A. L'Observatoire météorologique d'Aix-la-Chapelle. P. 384.

Teisserenc de Bort, L. Sur la mode de formation des types d'isobares. P. 389.

Das Wetter. Berlin. 17 *Jahrg.*
Kasner, C. Meteorologische Beobachtungen auf einer Reise nach Bulgarien. P. 217.
Bruckner. E. Ueber den Einfluss der Schneedecke auf das Klima der Alpen. (Schluss.) P. 222.
Sieberg, A. Sonnenringe und Nebensonnen. P. 235.
National Geographic Magazine. Washington. Vol. 11.
Algue, J. Manila Observatory. P. 427.
Newell, F. H. Limited Water Supply of the Arid Region. P. 438.
Proceedings of the Royal Society. London. Vol. 68.
Rambaut, A. A. Underground Temperature at Oxford in Year 1899 as determined by Five Platinum Resistance Thermometers. P. 218.
Memorias y Revista de la Sociedad Cientifica "Antonio Alzate." Mexico. Tomo 14.
Moreno y Anda, M. Contribution à l'étude Climatologique de la Vallée de Mexico. Pression Atmosphérique. P. 353.
Philosophical Magazine. London. Vol. 50.
Henderson, W. C. Experiments to determine whether a Liquid when Electrified loses any portion of its Charge by Evaporation. P. 489.
Archives des Sciences Physiques et Naturelles. Genève. 4me période. Tome 10.
Gautier, R. Résumé météorologique de l'année 1899 pour Genève et le Grand Saint-Bernard. P. 345.
Quarterly Journal of the Royal Meteorological Society. London. Vol. 26.
Hepworth, M. W. C. Remarks on the Weather Conditions of the Steamship Track between Fiji and Hawaii. P. 235.
Dines, W. H. Ether Sunshine Recorder. P. 243.
Meteorologische Zeitschrift. Band 17. *Wien.* 1900.
Exner, K. Windrichtung und Scintillation. P. 433.
Satke, L. Wolkengeschwindigkeit und -Richtung nach dreijährigen Beobachtungen in Tarnopol. P. 437.
Stentzel, A. Leuchtende und selbstleuchtende Nachtwolken. P. 448.
Meyer, L. Die Gewittervertheilung in Württemberg (mit Karte). P. 458.
Sapper, K. Meteorologische Beobachtungen in der Republik Guatemala im Jahre 1899. P. 459.
Meyer, L. Temperatur-Beobachtungen in verschiedenen Höhen des Münsterthurmes in Ulm. P. 463.
Billwiller, R. Starke Regenfälle und Hochwasser in der Südschweiz vom 21 bis 28 August 1900. P. 463.
Brillouin, M. Ursprung, Variationen und Perturbationen der atmosphärischen Elektricität. P. 465.
Chauveau, A. B. Ueber die tägliche Schwankung der Luftelektricität. P. 467.
Bork, H. Das Brockengespenst im Tieflande. P. 468.
Zoth, O. Ueber den Einfluss der Blickrichtung auf die scheinbare Grösse der Gestirne und scheinbare Form des Himmelsgewölbes. P. 468.
Knudsen, M. Der Einfluss der ostisländischen Polarstromes auf das Klima der Faröer. P. 470.
Sieberg, A. Sonnenring, beobachtet am Meteorologischen Observatorium zu Aachen I. Jahre 1900. P. 473.
Rotschuh, E. Das Nebensonnen-Phänomen von Aachen. P. 474.
Joubin, G. Polariskopische Beobachtungen während der totalen Sonnenfinsterniss. P. 475.
Elster, J. Ueber den Verlauf des elektrischen Potentialgefälles während der totalen Sonnenfinsterniss am 28 Mai 1900 zu Algier. P. 475.
Wolfer, A. Provisorische Sonnenflecken-Relativzahlen für das III. Quartal 1900. P. 476.

PROPERTY LOSS BY LIGHTNING IN THE UNITED STATES, 1899.

By ALFRED J. HENRY, Professor of Meteorology.

In 1898 systematic efforts were made by the United States Weather Bureau to ascertain the frequency of damaging or destructive lightning strokes throughout the United States. The results of the first year's work were published in Weather Bureau Bulletin No. 26, Lightning and Electricity of the Air, and also separately as Weather Bureau No. 199, Property Loss by Lightning, 1898. The collection of statistics bearing upon the loss of and damage to property was continued during 1899. As heretofore, dependence has been placed upon the reports furnished by agents and adjusters of farmers' mutual insurance companies, supplemented by press clippings obtained through one of the large newspaper-clipping agencies.

Farmers' mutual insurance companies operate mainly in the States of Illinois, Iowa, Minnesota, Wisconsin, Michigan, Nebraska, Missouri, Indiana, and Ohio. It may be assumed that for these States the returns that have been received are substantially correct as far as they go; it is not to be expected, however, that in a purely voluntary service, such as was freely given by the farmers' mutual companies, returns would be made for each loss sustained or that agents and adjusters would uniformly cooperate with the Weather Bureau. While the cooperation was much more complete in some States than in others, it does not necessarily follow that the statistics for one State are less complete than those for another, except in matters of detail. In general, newspaper clippings were relied upon to supply any lack of data that might be caused by failure of the mutual insurance companies to report their losses. At this point the question might naturally be asked, what proportion of damaging lightning strokes is reported to the newspapers? A categorical answer can not be given; probably three-fourths, possibly more. As a general proposition it may be assumed that substantially all of the larger losses, whether they occur in city or country, are sooner or later reported to the press. In the more thickly populated States the county newspaper generally contains a faithful chronicle of destruction by lightning throughout the county. It is only in the sparsely settled States and Territories that accounts of destructive flashes will fail of publication. There are, of course, many cases of lightning stroke in all communities accounts of which never appear in the public prints, mainly because the damage done is of little or no consequence.

The total number of reports received of buildings struck and damaged or destroyed by lightning during the calendar year 1899 was 5,527, about three times as many as were received during the previous year. In addition to the above number, 729 buildings caught fire as a result of exposure to other buildings that had been set on fire by lightning. The approximate loss in the 2,825 known cases was $3,016,520, or an average loss of nearly $1,100 per building. It would not be correct to assume that the same rate of loss was maintained in the remaining 3,431 buildings, for, as a general rule, it is only in the small and insignificant cases of damage or loss that the details are lacking. The number of insured buildings in the United States struck by lightning during 1899, according to the Chronicle Fire Tables, New York, 1900, was 2,760, with a total loss, including exposures, of $3,913,525, or an average of a little over $1,400 per building. These figures are largely in excess of the corresponding values for 1897 and 1898.

A summary of the material on which the report is based will be found in Table 1. The classification of buildings adopted in that table is practically the same as that of 1898.

The value of the data included in columns 7 to 13 is somewhat impaired by the fact that no information was obtainable in regard to a large proportion of the cases. The results, so far as obtained, agree closely with those of the previous year. The great majority of buildings struck by lightning were not provided with lightning rods, as was the case in 1898, but on the other hand 70 buildings provided with rods were struck and damaged.

Columns 17 and 18 have been added from the Chronicle Fire Tables for the purpose of comparison. It will be seen that, while there is a general agreement between the amounts reported in columns 16 and 18, respectively, there are several wide discrepancies. It is quite evident that the statistics collected by the Weather Bureau, which include both insured and uninsured property, fall short of representing the entire amount of loss by lightning. One of the significant facts of the table is the large number (3,431) of unknown cases of loss or damage. A conservative estimate of the total loss by lightning during the year would probably be $6,000,000.

In addition to the statistics of Table 1, a considerable number of strokes was reported as falling upon various structures,

TABLE 1.—*Reports received of buildings struck and damaged by lightning in the United States in 1900.*

States.	Total number.*	Kind.				Character of roof.				Rods.			Loss.			Loss of insured property.	
		Barns, sheds, warehouses, mills, factories.	Churches, schools, theaters, halls.	Dwellings, stores, office buildings.	Electric power plant.	Wood.	Slate	Metal.	Unknown.	Yes.	No.	Unknown.	Known cases of—	Unknown cases of—	Amount on buildings and contents.	Number of cases.	Total loss, including exposures.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Alabama	28	6	2	19	1	11		1	16	2	11	15	16	12	$21,654	9	$9,225
Arizona	7			7		4		1	2		6	1	6	1	4,380	1	1,000
Arkansas	11	5	1	5		1			10		1	10	3	8	1,025	3	3,700
California	6	2	1	2	1	1			5		1	5	5	1	29,050	4	17,450
Colorado	14			14		4	1		9		4	10	6	8	775	4	5,620
Connecticut	145	61	5	79		13	2		130		3	142	43	102	37,986	92	77,835
Delaware	27	10	3	14		3			24		2	25	9	18	6,850	10	11,300
District of Columbia	5	1	1		3	1	1		3		1	4	4	1	1,360		
Florida	22	4	1	17		5			17		4	18	6	16	8,357	4	10,100
Georgia	36	14	5	17		4			32		5	31	10	26	24,395	20	17,800
Idaho																3	25
Illinois	417	223	29	161	4	121	4	3	289	10	100	307	228	189	109,137	139	200,055
Indiana	197	100	16	80	1	40	8	8	141	4	36	157	103	94	101,750	89	117,565
Iowa	273	152	21	98	2	83			190	2	76	195	148	125	101,484	121	142,470
Kansas	76	30	3	42	1	9			67		9	67	31	45	22,749	39	42,450
Kentucky	61	27	7	26	1	5	1	1	54		6	55	23	38	26,834	30	28,895
Louisiana	6	1	2	3					6			6	4	2	2,075	4	5,550
Maine	208	126	7	73	2	5			203			208	78	130	121,185	70	143,990
Maryland	129	66	10	52	1	23	7	4	95	1	25	103	66	63	69,972	66	79,280
Massachusetts	276	100	26	142	8	20	9		247	1	9	266	93	183	147,480	140	142,425
Michigan	287	151	24	106	6	31	2		254	1	31	255	146	141	290,332	146	340,875
Minnesota	116	54	15	45	2	32		1	83		31	85	71	45	65,910	62	80,375
Mississippi	17	2	1	13	1	1	1		15	1	1	15	3	14	1,337	1	2,000
Missouri	155	61	17	75	2	35	2	1	117	3	32	120	72	83	31,264	46	54,825
Montana	12	4		7	1	2			10		3	9	6	6	258		
Nebraska	140	68	16	61		43	1	3	93	2	42	96	84	56	38,510	49	32,605
Nevada																	
New Hampshire	94	45	4	42	3	1	1		92		1	93	32	62	45,875	66	76,750
New Jersey	369	146	29	187	7	31	18	3	317	3	27	339	127	242	182,540	93	311,745
New Mexico	1			1					1			1	1		4,000	1	40,000
New York	1,080	629	56	381	14	302	28	19	731	18	308	754	539	541	491,098	399	563,730
North Carolina	46	25	4	16	1	10		2	34		11	35	24	22	15,154	18	38,540
North Dakota	20	11		9					20		2	18	6	14	24,785	23	15,550
Ohio	596	310	52	229	5	93	41	11	451	8	112	476	267	329	162,618	216	190,935
Oklahoma and Indian Territory	4	3		1		2			2		1	3	2	2	2,150	3	3,450
Oregon	2	1		1					2			2		2		2	600
Pennsylvania	719	400	44	269	6	27	16	1	675	9	19	691	237	482	479,155	412	515,110
Rhode Island	28	5	3	20		1		1	26			28	8	20	930	24	10,060
South Carolina	42	12	1	27	2	23		2	17	1	25	16	28	14	7,616	7	4,060
South Dakota	76	36	7	33		25		3	48	1	28	47	43	33	25,170	24	22,350
Tennessee	33	19	1	13		16	1		16	1	14	18	19	14	14,437	17	11,835
Texas	30	9	6	15		5	1	1	23		5	25	10	20	1,795	11	5,500
Utah	5	4			1	2			3		2	3	1	4	1,250		
Vermont	73	54	3	16			1		72			73	30	43	42,745	72	79,975
Virginia	56	29	2	25		10	2	1	43		7	49	27	29	18,855	33	39,580
Washington	3	3							3			3		3			
West Virginia	49	20	3	25	1	7	2	3	37		8	41	20	29	132,090	40	202,655
Wisconsin	258	136	28	92	2	70	3	1	184	2	60	196	140	118	98,148	145	213,005
Wyoming	1			1					1			1		1		2	700
Total	6,256	3,160	456	2,561	79	1,122	153	71	4,910	70	1,069	5,117	2,825	3,431	3,016,520	2,760	3,913,525

* The total number of strokes was 5,527; the figures given in this column include buildings set on fire by exposure to fires caused by lightning.

such as windmills, derricks, oil tanks, water tanks, coal breakers, bridges, vessels, railway cars, thrashing machines, cotton bales, grain in shock, etc. The damage to property of this character, so far as reported, was $215,622. Two very large losses, one of $90,000 the other of $65,000, are included in that sum.

In 1898, 52 per cent of the buildings struck were barns, sheds, warehouses, etc.; in 1899 the percentage of such buildings struck was 50; in 1898, 40 per cent of all buildings struck were dwellings, stores, and office buildings; in 1899 the percentage was exactly the same. Five per cent of all buildings struck in 1898 were churches and schools; in 1899 the percentage of such buildings struck had increased to 7. The agreement of these facts can scarcely be considered as a mere coincidence; it is more reasonable to suppose that lightning flashes fall upon buildings in about the proportions given above.

The number of electric power plants struck by lightning during the year was 79. It is probable, however, that a number of these were light discharges due simply to induction produced by the surgings of lightning strokes, within or near the field covered by the local circuits.

Careful watch was kept for cases of overhead trolley cars being struck by lightning. It was often difficult to differentiate between cases of direct lightning stroke and simple induced charges. The latter were very frequent and rarely resulted in more serious damage than the burning out of fuses. Some well authenticated cases of direct lightning stroke were observed, but in no instance was there loss of life or great destruction of property. More injuries to life and limb were occasioned by the occupants jumping from the cars while yet in motion than by the effects of the lightning flash. It is but natural that persons should become greatly terrified when an unusual discharge manifests itself on the car; experience has clearly shown, however, that the only thing to do is to sit still until the journey is completed.

Table 2 gives the number of reports of live stock in the fields killed by lightning during 1899, and the approximate value of the same.

The total number of strokes reported was 1,803 and the approximate value of the stock killed was $129,955. The number of strokes was about two and a half times as great as during the preceding year and the value of the stock killed was nearly three times as great. The increase in the number of live stock killed is directly proportional to the increase in the number of buildings struck.

The six States having the greatest number of fatal cases are as follows: Iowa, New York, Nebraska, Illinois, Ohio, and Wisconsin.[1] It will be observed that all these States are occupied by farmers' mutual insurance companies and it is to them that we are indebted for the completeness of the reports.

TABLE 2.—*Live stock in the fields killed by lightning during* 1899.

States.	Cattle.	Horses.	Mules.	Pigs.	Sheep.	Goats.	Value.	No. of strokes.
Alabama	2	4	5				$635	8
Arizona	9	7					685	9
Arkansas	1						15	1
California	4	3			11		233	4
Colorado	34	24	1				2,375	32
Connecticut	35						930	15
Delaware	1	4					320	4
District of Columbia								
Florida	2	3					205	3
Georgia	1	1	7	8			540	7
Idaho								
Illinois	236	105	5	24	1		16,061	164
Indiana	30	30	1	4	5		3,749	33
Iowa	483	87	2	19	67		20,120	333
Kansas	90	19	1				3,525	29
Kentucky	11	9	1		62		1,436	16
Louisiana								
Maine	19	1		1			440	15
Maryland	46	19		2	3		3,142	31
Massachusetts	33	3		2	4		930	14
Michigan	22	26		12	90		2,879	39
Minnesota	31	10		13	3		1,517	28
Mississippi	2	3	1				330	5
Missouri	114	28	7				7,191	64
Montana	5	3					410	5
Nebraska	220	41	1	45			9,763	176
Nevada		1					75	1
New Hampshire	21	3		4	8		689	16
New Jersey	46	10	1	6	85		2,147	36
New Mexico	7	1				53	315	5
New York	249	53		7	144		12,412	193
North Carolina	18	1	4	5	12		851	16
North Dakota	10	15					1,205	10
Ohio	160	75		39	127		13,008	143
Oklahoma and Indian Territory			1				50	1
Oregon								
Pennsylvania	151	33		6	70		6,023	85
Rhode Island	4	1					135	4
South Carolina	2	2	2				330	6
South Dakota	52	37		5	4		4,045	55
Tennessee	21	8	9		4		1,580	18
Texas		1					75	1
Utah								
Vermont	32	5					1,010	17
Virginia	22	11		8	43		1,869	20
Washington								
West Virginia	31	4	2		33		1,802	24
Wisconsin	129	22		28	40		4,808	116
Wyoming		1					75	1
Total	2,381	714	51	238	816	53	$129,955	1,803

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

[1] The relative area of the States will be found on page 397 of the MONTHLY WEATHER REVIEW for September, 1900.—ED.

Mexican data for October, 1900.

Stations.	Altitude.	Mean barometer.	Temperature. Max.	Temperature. Min.	Temperature. Mean.	Relative humidity.	Precipitation.	Prevailing direction. Wind.	Prevailing direction. Cloud.
	Feet.	*Inch.*	°F.	°F.	°F.	%	*Inch.*		
Durango (Seminario)	6,243	24 05	87.8	38.7	65.7	50	0.25	wsw.	sw.
Guanajuato	6,640	23.70	85.1	48.2	66.6	52	0.23	ne.	e.
Leon (Guanajuato)	5,934	24.30	82.6	44.6	65.3	54	0.17	nw.	e.
Magdalena (Sonora)	2,618				70.0			s.	ne.
Mazatlan	25	29.87	91 9	71.1	82.4	75	1.30	nw.	nw.
Merida	50	29.88	93.2	63.0	78.8	78	0.83	ne.	e.
Mexico (Obs. Cent.)	7,472	23.07	77.0	44.6	61.5	58	0.12	n.	ne.
Morelia (Seminario)	6,401	24.00	79.0	45.7	61.5	74	1.00	w.	ne.
Tampico	38	29.95	90.9	59.0	78.8	74	4.80	se.	

CUMULUS CLOUDS AT THE BAYONNE, N. J., FIRE.

By JOHN H. EADIE, Voluntary Observer, Bayonne, N. J.

I have read with much interest Mr. W. H. Mitchell's account of the great fire at the Standard Oil works in this place in July last, and can vouch for the accuracy of his description, although he describes several details which his close proximity enabled him to see and which were not witnessed by others. There is one matter, however, which he writes of with apparent confidence that I am not yet convinced is correct, viz, the formation of cumulus clouds over the column of smoke. I, too, saw these so-called clouds, although at a greater distance than Mr. Mitchell's station. I could not divest myself of the opinion that they were due to the illumination of the upper surface of the dense smoke column by the slanting rays of the sun, as they were not observed except where the smoke was densest. The column was very black, but it gave the appearance of being solid enough to reflect sunlight near its upper part.[1] No other clouds were near at the time and I could not avoid thinking that the so-called cloud owed its origin to the cause mentioned.

DRIFT ICE AND THE THEORY OF OCEAN CURRENTS.[2]

By REGINALD A. DALY.

The extraordinary smoothness of the sea covered by drift ice, even when the pans are widely spaced, is truly astonishing to one making his first voyage in such waters. His sailing ship may be favored with a fresh breeze, and yet the ocean surface be quite level, save for the minute rippling characteristic of a small pond ruffled by a summer breeze; ground swell does not exist. It is a matter of common knowledge among the fishermen of the Atlantic Labrador coast that the Labrador current, or "tide," as they invariably express it, often shows high velocity, although its surface for a length of 1,000 miles and a breadth of from 100 to 300 miles is covered with loose pan ice. At such times the wind is or has been strong and from a northerly quarter. We are justified in believing that the pans act as the sails which, in ice-free waters, are represented by wind waves. Floes and pans project above the surface from 1 to 20 feet or more. They may be expected to exert a coercive force on the film of relatively fresh water derived from the melting of the ice in contact with the heavier salt water beneath. According with the behavior of such "dead water," as described by Nansen and others, the light surface layer will tend to move *en masse* and in the direction of common pull exercised by the wind-driven masses of ice. By reason of friction the motion will be com-

[1] The Editor would suggest that observers favorably situated should observe and report whether in any case smoke clouds can so reflect sunlight as to appear like vapor clouds.

[2] Extracted from Science, November 2, 1900, Vol. XII, p. 688.

municated to lower layers of the sea. This cause of surface currents is of importance to the theory of movement of those polar waters which, for several months after the winter ice begins to break up, are free from larger wind waves. Deprived of its chief sails, the Labrador current, always sensitive to wind conditions and at times subject to temporary reversal with contrary winds, yet preserves and perhaps exceeds, during the period of ice drift, the average velocity of current flow for the year.

THE DYNAMIC PRINCIPLE OF THE CIRCULATORY MOVEMENTS IN THE ATMOSPHERE.

By Prof. V. BJERKNES, Stockholm, Sweden.

Read before the Deutsche Naturforschergesellschaft at Munich, August, 1899, and specially communicated to the MONTHLY WEATHER REVIEW.

The hydrodynamic equations of motion undoubtedly contain the key to the explanation of all atmospheric motions, but we meet with the great difficulty that we can not write the integrals of these equations for the complex conditions occurring in the earth's atmosphere. In order, therefore, to introduce rational dynamic methods into meteorology we must endeavor to devise a method by which we may apply the dynamic principles contained in these equations without integrating the equations themselves. In order to do this, we can scarcely suggest a better path than that followed by von Helmholtz and Kelvin for ideal fluids, when the former developed the laws of vortex motion and the latter developed the mathematically equivalent laws of circulatory movements.

As is well known, we attain the original Helmholtz-Kelvin theorems when we start with the equations of motion for frictionless fluids and supplement these by a restrictive assumption, viz, either that the fluid is homogeneous and incompressible or that the density of the fluid is a function of the pressure only. It is well known that this latter assumption is as far from the truth as the assumption that the atmospheric air is frictionless. These theorems of Helmholtz and Kelvin also show that circulatory and vortex motions can have neither beginning nor ending, and they therefore leave the fundamental question as to the initial formation of these motions undisturbed, so that they have only a very limited application in meteorology. But in order to attain more general theorems that do contain the laws of the formation and annihilation of both circulatory and vortex motions in the atmosphere, we need only follow the same course of reasoning that led to these theorems, starting, however, with assumptions of properties that better represent those of the natural fluids.

These generalizations are best executed step by step, and in doing this we can proceed according to either of the following schemes:

1. With von Helmholtz and Lord Kelvin we start with the equations of motion for frictionless fluids, but in the course of the study we avoid introducing any special limiting assumptions in reference to the density of the fluid.

2. We develop the corresponding theorems by starting from the equations of motion of viscous fluids (namely, those that have internal friction or viscosity).

A rearrangement of the theorems thus obtained will be found to be important in order to bring them into the form most appropriate for the proposed applications.

3. We refer all the theorems to a system of rotating coordinate axes in order that only the circulatory or vortex movements relative to the rotating earth may need to be considered in the proposed applications.

The first of these three general methods is beyond comparison the most important of all. Through it we attain to an exhaustive treatment of the primary causes of motion in the atmosphere, which, as is well known, are to be sought in the differences of density that depend upon the temperature. The second and third general methods only show how the motion already produced is modified in its subsequent course, partly by the "deflecting force of the earth's rotation," which seeks to change the direction of the motion, insofar as we consider the latter relative to the rotating earth, and, in part, by the friction which seeks to smooth out all differences of velocity.

In the following I shall consider exclusively this first general method and its applications to meteorology. In doing so, I shall deduce the theorem as one relating simply to circulation as an extension of Kelvin's mode of presentation. This method has important practical advantages over the mathematically equivalent form, where we start with Helmholtz's conception of a vortex.

At present I shall give the deduction of the theorem in the most elementary form possible, starting out with general dynamic principles and not with the hydrodynamic equations of motion. As to other methods of deduction and other forms of the theorem and other applications than those that are purely meteorological, I will merely refer to my previous publications.[1] I also refer to the memoir by L. Silberstein who first investigated that generalization of Helmholtz's vortex theorem which is now under consideration.[2]

Of the five sections into which this present memoir is divided, the first contains the definition of the term "circulation" as here used and the deduction of the mathematical properties of this conception, so far as they are needed in the subsequent sections. The second section describes a geometrical method of representing the dynamic condition of a fluid that is of equal importance to both the deduction and the application of the theorem. Finally, the third section gives the demonstration of the fundamental dynamic theorem relative to circulation and the two last sections treat of the applications of this theorem to the movements of the atmosphere. I would especially state that in the preparation of these last sections, the explanation and advice of Dr. N. Ekholm have been very useful to me.

I.—CIRCULATION.

Let us consider a continuous chain of fluid particles forming a closed curve. Each of these particles has a definite velocity, U, and the component of this velocity, tangential to the curve, is U_t. By the summation of these latter components, along the curve, we obtain

$$C = \int U_t \, ds, \tag{1}$$

where ds is a line element of the curve. The quantity, C, as found in this manner, we will call the circulation of the curve, s, as was done by Lord Kelvin.[3]

In reference to this conception of the circulation of a fluid curve, it should first be remarked that we may find its value for any given curve in the atmosphere by the observation of the wind. As an example, we may consider a curve which runs along the earth's surface as an arc of the meridian from the pole to the equator and then returns along a similar meridional arc at the altitude of the highest cirrus clouds from the equator to the pole. As elements of the curve we can make use of any appropriate degree of the meridian, and

[1] V. Bjerknes, Ueber die Bildung von Cirkulationsbewegungen und Wirbeln in reibungslosen Flüssigkeiten. Videnskabsselskabets Skrifter, Christiania, 1898. Ueber einen hydrodynamischen Fundamentalsatz und seine Anwendung besonders auf die Mechanik der Atmosphäre und des Weltmeeres. Kongl. Svenska Vetenskapsakademiens Handlingar, Band 31, Stockholm, 1898.

[2] L. Silberstein, Bulletin International de l'Academie des Sciences de Cracovie, 1886.

[3] Sir W. Thomson, On vortex motion. Transactions of the Royal Society of Edinburgh, 1869, § 60. Vol. XXV, p. 248.

as the positive direction of motion along the curve we can choose that which, at the earth's surface, passes from the pole to the equator and in its upper portion passes from the equator to the pole. The east-west component of the wind being perpendicular to this curve does not come into consideration, but only the north-south component directed along the curve. For each degree of the meridian we form the product of the mean average north-south wind component multiplied by the length of the degree and take the sum of the products. In this summation the vertical velocities do not come into consideration, first, because the vertical portion of the curve is inappreciably short in comparison with the horizontal, and, second, because also the vertical velocities are very small in comparison with the horizontal. The proper velocities at the earth's surface are found from the ordinary measurements of the wind; those in the upper regions from observations of the movements of the cirrus clouds. Dividing by the total length of the curve we obtain the mean velocity in the direction tangential to the curve.

The value, C, of the circulation for this curve can be considered as a measure of the circulatory movement of the atmosphere between the pole and the equator. The momentary value of the circulation, as found by using simultaneous observations, as well as the mean value for longer periods of time, such as months, seasons, or whole years can be found by this method.

A simple property of integrals of the form (1) will come into play both in the deduction of the fundamental dynamic theorem as also in all practical applications. Consider a series of curves, 1, 2, 3, . . . n adjacent to each other, as in fig. 1, and let C_1, C_2, C_3, . . . C_n be the corresponding values of the linear integrals, equation 1. Take the sum of all these linear integrals, assuming the same positive direction of circulation for each of the curves, then, as we can see by studying fig. 1, the linear integrals along every part of the curve that has two curves in common eliminate and disappear; for in the summation the corresponding linear integrals enter once positively and once negatively. The result of the summation is, therefore, simply equal to the linear integral, C, along the outer boundary, viz.,

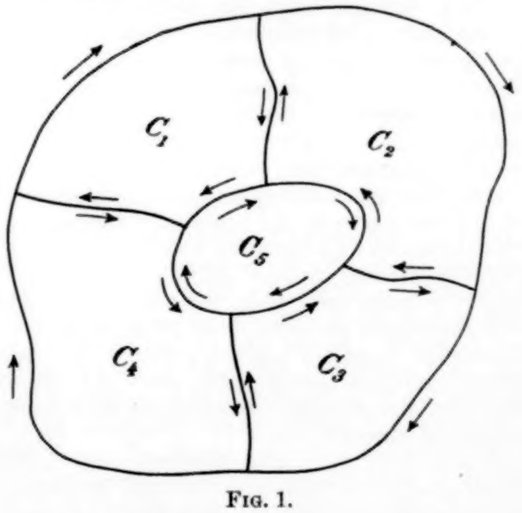

FIG. 1.

(2) $$C = C_1 + C_2 + C_3 + \ldots + C_n,$$

or, in other words:

The sum of the linear integrals along a series of adjacent curves is equal to the linear integral along the common exterior boundary.

The circulation between the pole and the equator, mentioned above as an illustration, can, therefore, be considered as the sum of a series of smaller individual circulations, of which, one, for example, may be the circulation in the trade wind region proper; another, the circulation in the middle latitudes; and a third, the circulation in the polar region. These individual circulations can be studied quite independently, and afterwards we can obtain the total circulation between the pole and the equator by simple summation.

It will now be our problem to find the law according to which the circulation of any given chain of particles of air changes with the time, under any given dynamic conditions. In order to prepare for the solution of this problem it will be appropriate to investigate the mathematical expression for the change of circulation with time.

It will be most convenient to use the rectangular coordinates x, y, z. Let dx, dy, dz be the projections upon these axes of the linear element of the curve ds, and let U_x, U_y, U_z be the projections upon the same axes of the velocity U of the point on the curve represented by x, y, z, then the expression (1) for the linear integral becomes

$$C = \int \left(U_x\, dx + U_y\, dy + U_z\, dz. \right)$$

If we differentiate this expression with reference to the time, then we must remember that the curve is in motion, so that not only the velocity components U_x, U_y, U_z, but also the projections dx, dy, dz of the linear element ds, vary with the time. Therefore such differentiation gives

$$\frac{dC}{dt} = \int \left(\frac{dU_x}{dt} dx + \frac{dU_y}{dt} dy + \frac{dU_z}{dt} d \right)$$
$$+ \int \left(U_x \frac{d}{dt} dx + U_y \frac{d}{dt} dy + U_z \frac{d}{dt} dz. \right)$$

We will first seek the value of the second line on the right-hand side of this equation. The differentiation with reference to time, indicated by $\frac{d}{dt}$ and the operation by which we have separated the curve into linear elements, in order to accomplish an integration along the curve up to a definite point of time, are entirely independent operations. We can, therefore, interchange the order in which these operations are performed and can write this second line as follows:

$$\int \left(U_x\, d\,\frac{dx}{dt} + U_y\, d\,\frac{dy}{dt} + U_z\, d\,\frac{dz}{dt} \right).$$

But we know that the differentials of x, y, z, with reference to t, are simply the velocity components U_x, U_y, U_z for the point x, y, z in the curve, viz:

$$\frac{dx}{dt} = U_x\,, \quad \frac{dy}{dt} = U_y\,, \quad \frac{dz}{dt} = U_z\,,$$

so that the above expression becomes

$$\int \left(U_x\, dU_x + U_y\, dU_y + U_z\, dU_z \right)$$

or,

$$\int \frac{1}{2}\, d \left(U^2_x + U^2_y + U^2_z \right).$$

But this is the integral of a total differential, and, therefore, is 0 when it is taken along any closed curve.

In the above expression for the differential of the circulation, C, with reference to the time, there now remains only the first line on the right-hand side, and this has a simple meaning. The differentials of the component velocities, U_x, U_y, U_z are the components of the acceleration V of the point x, y, z of the curve, viz:

$$\frac{dU_x}{dt} = V_x, \quad \frac{dU_y}{dt} = V_y, \quad \frac{dU_z}{dt} = V_z$$

The differential of the circulation with respect to the time is therefore

$$\frac{dC}{dt} = \int \left(V_x\, dx + V_y\, dy + V_z\, dz. \right)$$

That is to say, if we designate by V the component of the acceleration in the direction tangential to the curve, we have

$$\frac{dC}{dt} = \int V_s\, ds \tag{3}$$

or: *The increase of the circulation of a closed curve in a unit of time is equal to the integral, taken along the curve, of that component of the acceleration that is tangential to the curve.*

In order to find the dynamic law of the change of the circulation with the time, we therefore need only to integrate the component accelerations due to the individual active forces in the direction tangential to the curve. Therefore, all accelerating forces that have a linear integral equal to zero along closed curves are unimportant. This leads us to a very important simplification of our problem, for it is well known that all accelerating forces of a conservative nature have this property. Therefore, in considering the circulation along closed curves in the atmosphere we need never take into consideration the force of gravity, since it is a conservative force.

If at the same time we also, in accordance with our assumptions, omit the consideration of friction and the deflecting force of the earth's rotation, then we shall only have to consider the accelerating force resulting from the pressure of the fluid. The linear integral of this force will be easily determined after we have considered a geometrical presentation of the dynamic conditions in the interior of gaseous or fluid media.

II.—GEOMETRIC PRESENTATION OF THE DYNAMIC CONDITIONS IN LIQUID OR GASEOUS MEDIA.

The distribution of the pressure p in any gas or liquid can be shown with the help of surfaces of equal pressure or isobaric surfaces for which p is constant The gradient G is perpendicular to the isobaric surfaces, and is directed toward the diminishing pressure. If n is the normal to an isobaric surface, and is directed against the increasing value of the pressure (i. e. toward the lower pressure), then the expression for the gradient may be written

$$G = -\frac{dp}{dn}. \tag{4}$$

It will be especially convenient to draw the isobaric surfaces for pressure differences of one unit. By a convenient choice of units we can always bring it about that the isobaric surfaces shall run close enough to each other to represent the distribution of pressure in the fluid with sufficient completeness.

The acceleration that the gradient communicates to a particle of fluid depends on the inertia, that is to say, on the density of the particle; it is equal to the gradient divided by the density, or, still simpler, it is equal to the gradient multiplied by the specific volume, k, of the fluid particle. In order to be able to express the distribution of the acceleration so far as it depends upon the pressure, it is therefore sufficient to know the distribution of pressure and at the same time that of the specific volume throughout the fluid. This distribution can be expressed with the help of surfaces of equal specific volume, or isosteric surfaces, for each of which k is constant. These surfaces we always think of as drawn for each unit of difference of the specific volumes and, in doing so choose a unit of convenient magnitude such that the surfaces lie sufficiently near to each other, in order to represent the distribution of the specific volume in all portions of the fluid, with satisfactory accuracy.

Following the analogy of the gradient, we can define a vector, B, by the equation

$$B = \frac{dk}{dn} \tag{5}$$

where n is the normal to an isosteric surface taken positively in the direction of increasing specific volumes. Therefore B is a vector quantity that points in the direction of increasing specific volumes and since the mobility of the fluid increases with the specific volume, we can call B the vector of motion. It will be remarked that in equation (5) we have used the positive sign, whereas in equation (4), defining the gradient, the negative sign occurs. A vector quantity $(-B)$, defined in complete analogy with equation (4), would in general have a direction almost exactly opposite to the direction of the gradient, since with diminishing pressure an increasing specific volume usually follows. On the other hand, the vector of motion, B, has approximately the same direction as that of the gradient, G, and is therefore to be preferred to $-B$ in the applications.

Some general remarks as to the course of the isobaric and the isosteric surfaces are important.

1. It is to be considered that an isobaric surface can never come to an end in the interior of a fluid; it must either reenter into itself or else end at the boundary surfaces of the fluid. The isobaric surfaces in the atmosphere, for instance, either surround the whole earth as closed surfaces, agreeing very closely with the level surfaces of gravitation, or else they end against the surface of the earth which cuts them along the isobaric curves that we draw by means of ordinary barometric observations.

The isosteric surfaces have precisely the same property; they can not end in the interior of a fluid any more than can the isobaric, but they must continue on until they run into themselves or until they end against the bounding surfaces of the fluid. In the atmosphere they have, approximately, the same course as the isobars; the upper isosteres surround the whole earth, whereas the lower ones intersect the earth's surface along the isosteric curves.

A second property of the isobaric surfaces is that two neighboring surfaces, representing different values of the pressure, p, can never intersect each other; throughout their whole course they must be separated from each other by an isobaric layer, which, on its part, has the same fundamental property as the surfaces, namely, either returning into itself or terminating against the boundary surfaces of the fluid. Similarly, the successive isosteric surfaces are separated from each other by corresponding isosteric layers.

These two sets of surfaces together divide the whole space into tubular or prismatic portions, which we may designate as *isobaro-isosteric tubes*. From the properties of the isobars and the isosteric layers that belong to these tubes, it follows that the latter also have this peculiarity that each either runs into itself or terminates at the boundary surfaces of the fluid. If the surfaces are drawn for each unit difference of pressure and of specific volume, we may call the corresponding tubes, *unit tubes*. If we assume that we use the units just mentioned of proper dimensions, then we may consider the corresponding unit tubes as infinitesimal *solenoids*. The cross sections of the larger isobaro-isosteric tubes have the form of curved quadrilaterals; the cross sections of the solenoids are rectilinear parallelograms.

Since the solenoids have this property that they either return into themselves or terminate at the boundary surfaces, therefore, every closed curve in the fluid incloses a definite bundle of solenoids; the number, A, of solenoids in this bundle becomes a simple definite number as soon as the units of specific volume and pressure have been chosen.

III.—DEDUCTION OF THE FUNDAMENTAL DYNAMIC THEOREM RELATIVE TO THE CIRCULATION.

In order to investigate the dynamic conditions necessary for the existence of circulatory movements as a consequence of fluid pressure, we will consider a portion of the fluid

so small that within it we may consider the specific volume and the pressure as linear variable qualities. In this portion of the fluid the isobaric surfaces extend as a set of parallel equidistant planes, and the isosteric surfaces as another set of parallel equidistant planes. The solenoids are tubes whose cross sections form a system of parallelograms congruent to each other. Throughout this part of the fluid the gradient will have an invariable magnitude and direction, and this will also be the case with the vector of motion.

If all particles of the portions of the fluid under consideration had had equal specific volumes, then the gradient would have communicated an equal acceleration to all points, and the result of the effect of the gradient during an element of time would have remained a simple pure motion of translation superposed upon the previous velocity of this part of the fluid. But on account of the variability of the specific volume from point to point the different points will take up accelerations of different amounts, in such a way that the lighter portions will move more swiftly than the heavier. Thus therefore, the gradient produces not only a translatory but also a rotatory motion, by virtue of which the fluid masses are turned around the intersections of the isobaric and isosteric surfaces as axes, and in the direction from the vector of motion, B, by the shortest way to the gradient G.

By reason of this rotation of the fluid masses, there results a circulation of all closed curves consisting of particles of fluid. We need consider only plane curves within the small portion of the fluid under consideration. The following rule will determine the direction of the acceleration of circulation that one of these curves experiences:

Project the gradient and the vector of motion on the plane of the curve; then the acceleration of circulation is directed by the shortest route from the projection, B, of the vector of motion toward the projection, G, of the gradient. (See fig. 2.)

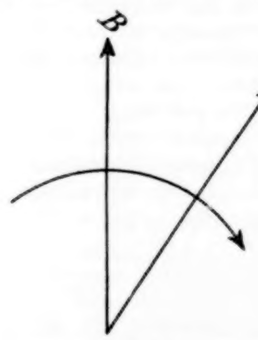

Fig. 2.

In order to find the quantitative law for the resulting acceleration of circulation we recall that according to formula (3) the increase per unit of time in the circulation is proportional to the line integral of the component of the acceleration that is tangential to the curve. We will first seek to determine the value of this line integral of the acceleration for the curve produced by intersection of an isobaro-isosteric tube with any arbitrary plane. This curve has a parallelogrammatic form, fig. 3, two of whose parallel sides, p_0 and p_1, lie in an isobaric plane and two, k_0 and k_1, in an isosteric plane. If h is the distance of the two isobaric planes from each other, then the gradient has the numerical value

$$G = \frac{p_1 - p_0}{h}.$$

Since the gradient is perpendicular to the two isobaric sides of the parallelogram, it can cause no acceleration in a direction tangential to these lines. But the gradient forms an angle, θ, with the isosteric sides of the parallelogram and consequently produces, in a direction parallel to these lines, the component accelerations $k_1\ G \cos\theta$ and $k_0\ G \cos\theta$. If we refer both these to the same direction of circulation around the curve, $p_0\ k_0\ p_1\ k_1$, then they become

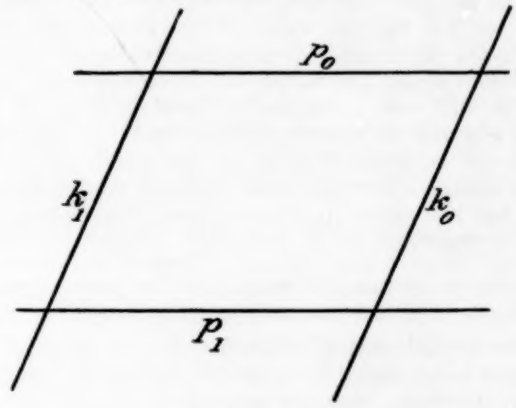

Fig. 3.

$$k_1\ G \cos\theta \text{ und } - k_0\ G \cos\theta.$$

In order to find the value of the line integral we have to multiply these quantities by the length of the corresponding line elements and add the products thus formed. But both sides of the parallelogram have the same length, $\frac{h}{\cos\theta}$, so that we find $(k_1 - k_0)\ Gh$ as the value of the line integral. If we introduce the above value of the gradient, G, this integral becomes

$$(k_1 - k_0)\ (p_1 - p_0).$$

Finally we may specialize by the assumption that the isobaro-isosteric tube under consideration is a solenoid. According to the definition of the solenoid $k_1 - k_0 = 1$ and $p_1 - p_0 = 1$, and hence the line integral contains the simple numerical value, 1. Therefore, we find the simple result:

The increase per unit of time in the circulation of a curve which is the section of a solenoid by any given plane has the numerical value of unity. We have already determined the direction of this increase of circulation, and in order to distinguish the two opposite directions from each other we may designate the increase of circulation by $+1$ when its direction agrees with the direction chosen as positive for the movement along the curve and by -1 in the opposite case.

We easily pass from the result just found for the circulation of a curve, that is the intersection of a plane with a solenoid to the corresponding general theorem for any curve whatever. Through the given arbitrary curve we draw a surface which intersects all the solenoids inclosed within the curve. On this surface the solenoids determine a system of parallelogrammatic curves, each of which receives in the unit of time an increase of circulation of either $+1$ or -1. But according to the summation theorem No. 2 for line integrals, the line integral along the exterior contour is equal to the sum of the line integrals along all individual contours, and, therefore, is simply equal to the number of the included solenoids if all turn in the same direction, otherwise it is equal to the excess, A, of the number of solenoids turning positively over the number turning negatively. Since this line integral is equal to the increase per unit of time in the circulation, C, of the curve under consideration, we can, therefore, express the result by the formula

$$A = \frac{dC}{dt} \qquad (6)$$

If we express the enumeration in question algebraically we can consider the number, A, with its algebraic sign, simply as the number of solenoids inclosed within the curve and can express the result by the following theorem:

The increase in a unit of time in the circulation of any given

closed curve is equal to the number of solenoids inclosed within the curve.

With the help of this theorem we can follow the variation with time of the varying value of the circulation of a closed chain of fluid particles, provided that we know at every moment the courses of the isobaric and isosteric surfaces. The number, A, will vary continually for two reasons: First, because the curve is in motion, and, second, because the isobaric and isosteric surfaces vary in consequence of the varying form and location of the conditions as to density and pressure, so that the curve incloses a bundle of solenoids that is continually varying.

IV.—THE MOST IMPORTANT CIRCULATORY MOVEMENTS OF THE ATMOSPHERE.

We have already called attention to the general course of the isobaric and isosteric surfaces in the atmosphere. In general, these surfaces succeed each other quite accurately because the density in general increases and diminishes with the pressure. They would be absolutely parallel if the density were a function of the pressure only. In that case the two systems of surfaces would not intersect each other and no solenoids would be formed. Under these circumstances the circulation of a curve in the atmosphere could be neither accelerated nor retarded, but would be a constant characteristic of the curve. This is the well-known result to which we arrive as the basis of the Helmholtz-Kelvin theory.

However, the density or the specific volume of the air is never a function of the pressure only, but also depends on the variability from point to point of the temperature and moisture. Since the influence of the moisture on the specific volume of the air is unimportant we will in the following qualitative study, for the sake of simplicity, consider only the temperature. We have then to recall that when the temperature is high the specific volume of the air is greater than would be expected for the given pressure, and when the temperature is low the specific volume is smaller. Hence in hot regions we shall have at the surface of the earth the same specific volumes of the air that in colder regions are to be found only in the higher layers of air. Therefore, the isosteric surfaces must deviate from the isobaric surfaces, and always in such a way that in hot regions they are lower, in cold regions higher than the corresponding isobaric surfaces. Therefore, the two sets of surfaces must necessarily intersect each other and form solenoids that cause a circulatory motion of the atmosphere. The general nature of this circulatory motion is easily deduced from the known distribution of pressure and temperature with the help of our fundamental theorem.

First, we may disregard all seasonal and diurnal variations of temperature and pressure, and all irregularities of a local nature arising from the distribution of land and ocean, or from the nature of the earth's surface. Therefore the pressure will be quite uniformly distributed over the whole globe, and will show no important differences in the polar and the equatorial regions. Hence the isobaric surfaces will be almost exactly parallel to the earth's surface. On the other hand, the polar regions have a low and the equatorial regions a high temperature, so that the isosteric surfaces are elevated in the polar regions and sink toward the equator. The two sets of surfaces intersect each other and form solenoids that surround almost the whole earth like parallel circles. A meridional section through this system of solenoids is illustrated by fig. 4, in which, as in all the subsequent figures, the isobars are represented by fine and the isosteres by heavy lines and the altitude of the atmosphere is much exaggerated. The gradient, G, is directed vertically upwards, the vector of motion, B, on the other hand, is inclined somewhat toward the equatorial side, and the acceleration of the circulation directed from the vector of motion toward the gradient will produce a circulation by virtue of which the air at the earth's surface flows from the poles toward the equator, where it ascends and then again flows toward the poles only to sink again in higher latitudes. This is the well-known general circulation between the poles and the equator which, especially in the trade-wind zone, appear as a regular well-developed movement.

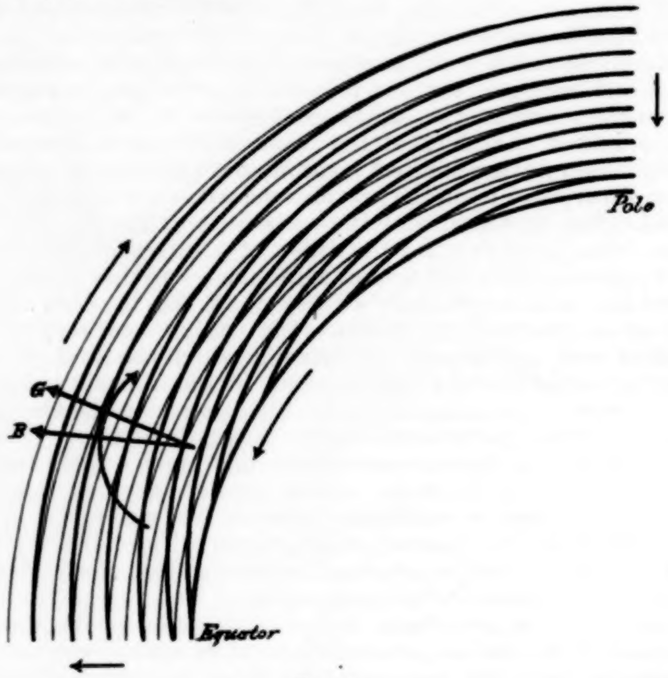

FIG. 4.

Connected with this broad, steady circulation, there is a series of smaller movements of periodic nature, which all arise from the seasonal and diurnal variations of temperature in connection with the irregular peculiarities of the earth's surface. The importance of the peculiarities of the surface of the earth depends upon the fact that the atmosphere is only to a slight extent warmed by direct insolation and only slightly cooled by direct radiation. It is at the surface of the earth that the large variations of temperature occur in consequence of insolation and radiation, and thereby the adjacent strata of air are warmed or cooled indirectly. Therefore, the ranges of temperature in this stratum of air vary according to the peculiarities of the surface of the earth.

In this respect the most important consideration is the difference between land and ocean. The land is warmed by insolation and cooled by radiation more quickly than is the ocean. Therefore, the air over the land is warmed more by day and cooled more by night than the air over the ocean. The isosteric surfaces during the daytime are, therefore, relatively high above the ocean and relatively low above the land; they must, therefore, intersect the horizontal isobaric surfaces and form a system of solenoids that follow along the coasts.

A section through this system of solenoids is illustrated by fig. 5; the acceleration of the circulation directed from the vector of motion toward the gradient induces a circulation by reason of which the air at the surface of the earth flows from the sea toward the land, where it rises, and, after flowing backwards, sinks again to the sea. At night time everything is reversed; the isosteric surfaces then lie higher over the land than over the sea; the solenoids change their signs and induce circulation in the opposite direction. Thus we observe the well-known phenomena of the land and sea winds.

The seasonal change of temperature makes itself felt in the same way as the diurnal change. In summer the isosteric surfaces over the continents are in general lower and over

the oceans higher than the corresponding isobaric surfaces. The solenoids thus formed along the coast produce a circulation in which the wind at the surface of the earth has on the average a direction from the sea to the land rather than the contrary. In winter the isosteric surfaces over the continents are on the average higher and over the oceans lower than the corresponding isobaric surfaces; the solenoids lying along the coast have opposite signs and induce a circulation in which the wind at the surface of the earth is directed principally from the land toward the sea. Thus we arrive at the well-known phenomena of the monsoon winds.

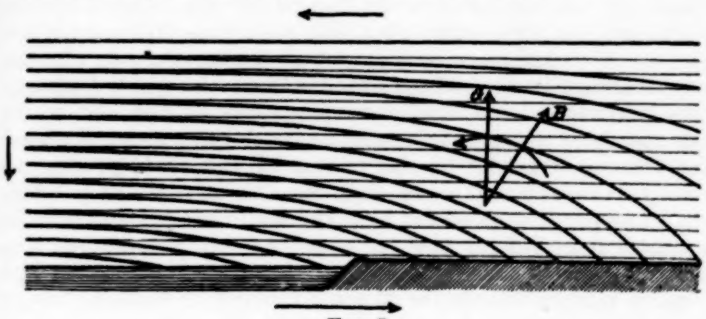

FIG. 5.

In addition to the distribution of land and water, the orography of the earth's surface comes into consideration. The strata of air warmed by insolation or cooled by radiation have the same form as that of the surface of the earth before the conditions are modified by the motions of the air. Above a horizontal plane surface the air strata have the form of a horizontal disc, and the isosteric surfaces, notwithstanding their rise and fall in consequence of the change of temperature, retain the form of horizontal discs so that they can never intersect the isobaric surfaces which also lie as horizontal planes. On the other hand, on the declivity of a mountain the strata of air, warmed by insolation and cooled by radiation, have an inclined position. In the daytime when this layer is warmed more than the surrounding air, the isosteric surfaces, which are horizontal planes at a great distance, sink lower if they, when prolonged, intersect this layer and cut the isobaric surfaces that lie as horizontal planes.

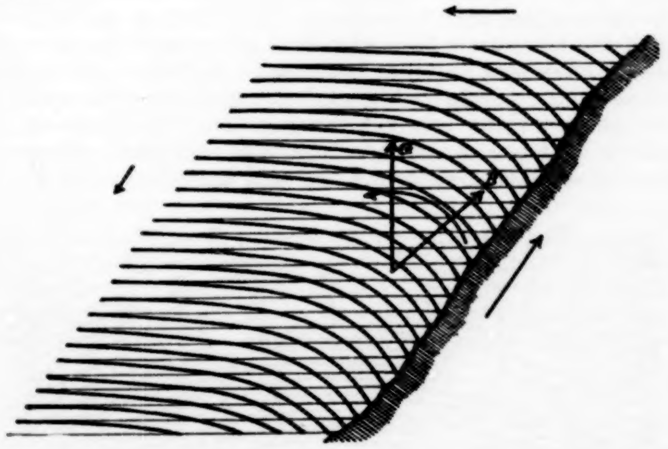

FIG. 6.

Along the slope of the mountain a system of solenoids will be formed, a section of which is illustrated by fig. 6. The acceleration of circulation directed from the vector of motion to the gradient will induce a circulation in which the air ascending along the slope, rises above the summit of the mountain only to flow back at some upper level and sink down again at a greater distance. At night time this layer of air is colder than the rest of the air; the isosteric surfaces, which at greater distances lie horizontal and plane, lie higher within this layer; the solenoids have the opposite sign and produce an opposite acceleration; therefore the cold air flows downward and sinks to the bottom of the valley, while the air pushed thence, ascends and gradually replaces the air that has flowed away at higher altitudes. This explains the day and night winds that occur regularly in mountainous countries, where the day wind is directed from valley to mountain top, and the night wind from the mountain down to the valley.

This latter phenomenon is more pronounced in proportion as the mountain is larger. On the other hand, the smaller the irregularities on the surface of the earth by so much the feebler the intensity and more irregular the course of the solenoids will be. Without causing important winds in definite directions at the surface of the earth, these solenoids will induce local ascending currents of air irregularly distributed, which in fine weather are the causes of the formation of cumulus clouds. So long as the ascending masses of air are warmer than the surrounding air the isosteric surfaces will have depressions where they pass through these masses

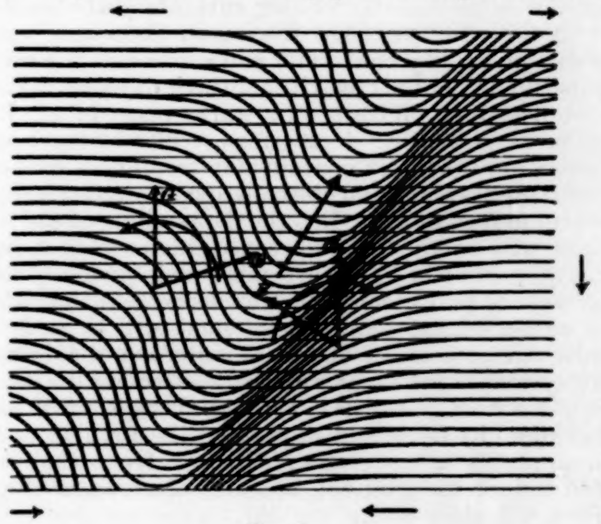

FIG. 7.

of air. A vertical section through such a column of ascending warm air is illustrated in fig. 7, while in fig. 8 is illustrated the extreme case in which a separate mass of air is so strongly

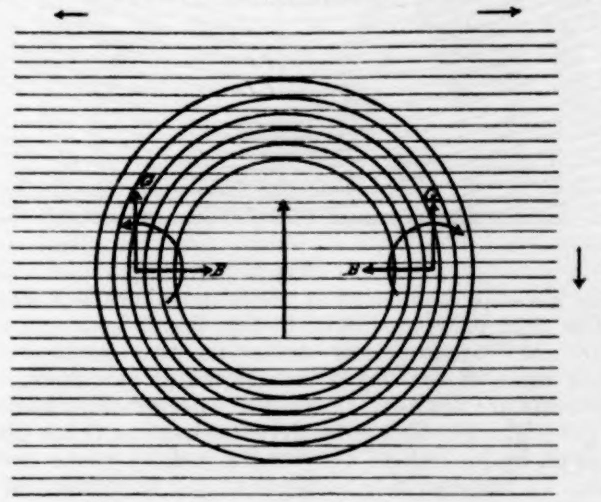

FIG. 8.

heated that its specific volume is even greater than that of the air lying vertically above it. This mass of air is there-

fore surrounded by closed isosteric surfaces which are here drawn as circles. In order to simplify the drawing, the variation with altitude of the specific volume of the surrounding air is disregarded. In both cases the circulatory acceleration, directed from the vector of motion toward the gradient, will produce a circulation in which the interior light masses of air must rise relatively to the exterior heavy air. In the last case, in which the isosteric surfaces are closed, this ascending movement also results as a consequence of the law of Archimedes relative to buoyancy. This latter law can, therefore, be considered as a peculiarly special case of our law of circulation.

The influence of the rotation of the earth is only slightly felt in the land and sea winds or mountain and valley winds which depend on the alternation of day and night, because we have here rapidly changing directions of motion, so that the deflecting force of the earth's rotation can have no long-continued accumulative effect. But we can imagine conditions to exist by virtue of which the air over a large area of the earth may, during many days be heated more than the surrounding region. As a consequence of the insolation this will occur most easily over extended plains where the ventilation due to the local ascending currents just considered is but slightly effective. On the ocean the warm ocean currents surrounded by cold water can cause such a warming of the superincumbent air as will continue day and night without interruption. Within this warm mass of air the isosteric surfaces become depressions. The isobaric surfaces can also simultaneously contain depressions, in consequence of diminished weight and the consequent smaller pressure of the warm masses of air. But the depressions of the isosteric surfaces will be the larger because these surfaces, in consequence of diminished pressure must sink precisely as much as the isobars, and because to this depression that which depends on the higher temperature must still be added. The isosteric surfaces must, therefore, intersect the isobars and form a system of solenoids which will surround the hot masses of air like a ring. A section through this system of solenoids is illustrated by fig. 9, and shows that the circulatory acceleration produces a circulation directed from the vector of motion toward the gradient, in which the masses of air flowing from all sides along the earth's surface rise in the central regions, and higher up flow away only to descend again at a great distance.

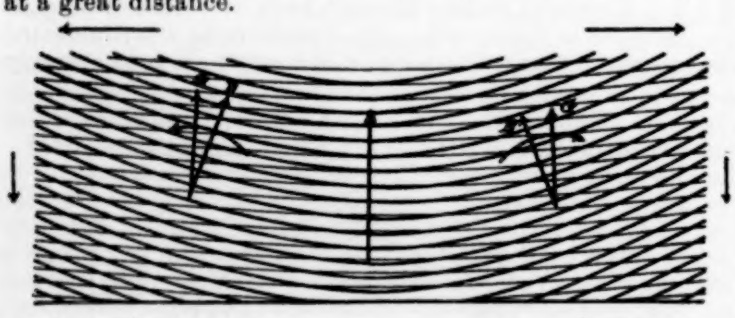

FIG. 9.

The general movement of the atmosphere is quite analogous to that just considered in figs. 7 and 8, except that the preliminary assumptions differ in two particulars; the heated mass of air has a much greater extension, and the conditions are not such that all are necessarily reversed during the night whether it be that the heating takes place over the land, by insolation, or over the sea, by warm ocean currents. In the resulting long-continued movement of the air over great distances the deflecting force of the earth's rotation makes itself felt and the original radial inflow of the air below and the corresponding outflow of the air above are turned into movements of a spiral nature. Therefore, the rotation in horizontal planes is superimposed on the original circulation in vertical planes and the friction *alone* sets a limit to the intensity of the two movements. When the movement has attained such an intensity that the motion is large in comparison with the forces that cause it then the conditions are such that for a first approximation we are justified in making application of the Helmholtz-Kelvin vortex theorems; the vortex that is formed will then, so to speak, endeavor to retain its individuality and can only slowly change by the forces that act upon it to increase or destroy the vortex. Therefore, when the conditions are favorable thereto the whole mass of air under consideration can be carried onward by the general atmospheric currents while retaining its own vortex motion. A progressive movement of the vortex can also be brought about, in that the center itself of the whirl-forming forces progresses, and, therefore, alongside of the old whirl there goes on a more or less continuous development of a new one. Such a transfer of the center of the whirl-producing forces becomes possible as soon as the movement [of the whirl] has progressed so far that the warm air present within the center is no longer the air that has been warmed *in situ* by reason of the given local conditions, but is air that has flowed in from without, for the air flowing in from different sides will, in general, have correspondingly different temperatures, and, on account of this want of symmetry, the place where the air is hottest, and where, therefore, the isosteric surfaces have their greatest depressions, will not coincide with the momentary center of the whirl. The system of solenoids will, therefore, move and a new whirl will form alongside of the old one and unite with it to form a whirl somewhat further forward. With the new whirl the same process is repeated, and we thus get a vortex advancing from one place to another, as we observe in the case of cyclones.

A local surplus would arise because of the many ascending currents in the atmosphere if there were not also corresponding descending movements. This descending movement can either be distributed uniformly over large areas, and be, therefore, less noticeable, or it can be localized in more definitely limited descending currents of air. This latter will occur with special ease when great masses of air that are colder, and, therefore, denser than the surrounding air, have collected in the upper strata of the atmosphere. On account of the greater pressure of the denser masses of air the isobaric surfaces will be higher in this region; the isosteric surfaces will also at the same time be higher both because of the increased pressure, causing a rise that is the same as that of the isobaric surfaces, and a further addition because of the contraction in consequence of the lower temperatures. The isobaric and isosteric surfaces must, therefore, intersect each other and form solenoids that surround the cold masses of air. Fig. 10

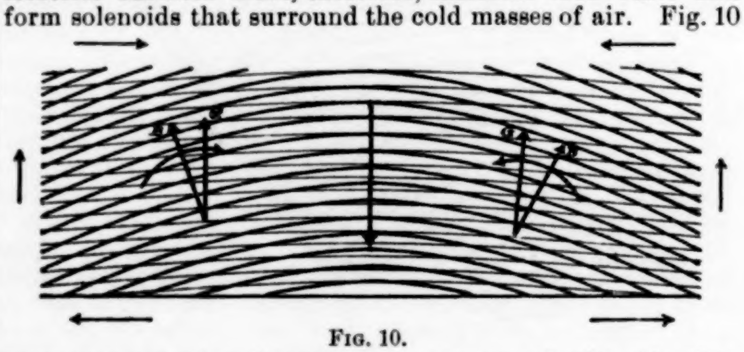

FIG. 10.

represents a section through such a system of solenoids after the movement has continued for some time so that the denser masses of air have descended to the surface of the earth. The acceleration of circulation directed from the vector of motion, B, to the gradient, G, will give rise to a circulation in which the air in the higher strata flows inward from all sides, sinks down in the central region, flows slowly along the earth's

surface, and ascends again at some distance. If the circulation continues for a long time, then the radial inflow above as well as the radial outflow below will change into movements of a spiral nature in consequence of the influence of the rotation of the earth. In this way we arrive at the phenomenon of the anticyclone.

In the preceding development we have adopted the so-called physical theory of cyclones and anticyclones, according to which an ascending current of warm air is considered as the primary cause of the formation of a cyclone and a descending current of cold air as the primary cause of the formation of an anticyclone. It is well known that another theory has also been advanced, the so-called mechanical theory, according to which the primary cause is to be sought in the collision between the great atmospheric currents in the upper strata of air; or the cyclone and anticyclone are to be considered as formations on the edges or boundaries of the great circulations of the atmosphere. So far as I know, no accurate development of the theory of cyclones and anticyclones, based on this theory, has been published, and, therefore, we can not go into a positive discussion of it. On the other hand, we can formulate a criterion by which, through purely empirical investigations, we may decide to what extent the physical theory gives a satisfactory explanation of the mechanics of the formation of cyclones or anticyclones.

To this end we assume that we know the distribution of density, pressure, and wind at every moment since the formation of a cyclone or anticyclone. Therefore we can construct the isosteric and the isobaric surfaces and find the number of the solenoids present at every moment, and equally, from the observations of the wind compute the circulation along different closed curves at various times. If now the physical theory is correct, then the number of solenoids that are, or have been present must suffice to explain the existing circulation or velocity of the wind. Of course we can only make accurate computations when we also take into consideration the friction and the rotation of the earth. But if, for instance, we find that in a cyclone that has existed for three days, only so many solenoids have been present as could, ignoring friction, produce only a small percentage of the existing circulation in the course of three days, then we must conclude that other forces have been active in forming the cyclone as well as those represented by these solenoids. On the other hand, if we find that, omitting the rotation of the earth and the friction, the number of solenoids present is sufficient to produce the existing circulation or wind velocity in the course of a few hours, then we must conclude that during the three days a great excess of force must have been present in order to overcome during this time the resisting forces not explicitly considered. Whether this excess also precisely suffices can be decided only after completely taking account of the earth's rotation and the friction. Moreover, it is only after we have demonstrated the insufficiency of the motive forces that depend on the solenoids locally present in the cyclone, that we can have any reason to seek for other causes of formation of cyclones and take into consideration the more distant solenoids of the general atmospheric circulation.

This example has a special interest because it has to do, not with an impracticable ideal experiment, but with investigations that can be and, indeed, have already in part been carried out, although, in truth, no cyclone has as yet been completely investigated by means of simultaneous observations in the upper strata of the air. However, at Blue Hill they have succeeded in obtaining a section through a passing anticyclone and cyclone by observations, with kites, on four successive days, September 21–24, 1898. My pupil, Mr. Sandström, has constructed the isobaric and isosteric surfaces of this cyclone from the observations published by Mr. Helm Clayton, so far as was possible by combinations of the observations made on these different days and will, it is hoped, soon publish his work on this subject. I will here only remark that the number of the existing solenoids found in this manner is so great that they suffice to develop the strongest observed wind velocity in the course of a few hours. The great interest that is now shown in obtaining observations in the higher strata of the atmosphere leads us to hope that it will not be long before it becomes possible to follow the complete history of the development of a cyclone by means of systematic simultaneous observations at different places, instead of being compelled, as in the present case, to construct a hypothetical condition for any moment from observations made at different times. By means of such simultaneous observations we shall be able to decide between the mechanical and the physical theories of the progressive movement of a cyclone. If the physical theory is correct, so that a continuous new formation of whirls takes place near the old one, then the system of solenoids must somewhat precede the whirl proper; if, on the other hand, the cyclone is carried forward by the general atmospheric current, then the solenoid system, if one is present, will follow the whirl exactly.

In the preceding we have for simplicity considered the trades, monsoons, land and sea breezes, mountain and valley winds, cyclones and anticyclones as phenomena isòlated from each other. But in fact a complete isolation of these systems of wind from each other is not practicable, but the actual (natural) winds always have more or less complex causes, and it is only in order to simplify this review of the subject, that we have made use of this schematic analysis into individual phenomena. Any such analysis will seem artificial in the direct application of this present theory to practical meteorology, where we observe the existing distribution of density and pressure in connection with the existing winds. No matter how complicated the conditions are we then have always to do with the real winds and their real causes. Thus this present theory differs fundamentally from the ordinary dynamic theories that are founded on the solution of special integrals of the equations of motion, and where one must first assume a general, farfetched idealization of actual conditions before the theory can be brought to apply.

If, therefore, one would study the motions of the atmosphere by using the theory here developed, then the problem would be to find the actual course of the isobaric and isosteric surfaces in the atmosphere, and the courses of the solenoids formed by these groups of surfaces. In this investigation we will only exceptionally, or in general never, find the ideal conditions above assumed. We shall never find solenoids that precisely follow the parallels of latitude, and, therefore, produce pure trade winds. Quite as rarely shall we find solenoids that follow the coasts, precisely for long distances, and, therefore, produce a pure land and sea wind. We shall rather find that the actual solenoids generally encircle the whole globe as tubes or curves of rather irregular form, and that they generally have more or less decided changes of direction in the passage from land to sea, and, moreover, are always in motion with the change from day to night, and from summer to winter. During the daytime, or the summer, the solenoids over the land deviate toward the polar side; during the night, or in winter, they deviate toward the equatorial side. If we make these actual solenoids the basis of our study we gain the advantage that we see the actual winds in connection with their actual and complete causes. For example the Indian monsoon will thus be seen to be neither a pure land and sea breeze nor a pure trade wind, but a combination of land and sea wind and trade wind, as it really is.

For similar reasons one must not expect to see the circular system of solenoids above mentioned always perfectly developed in the cyclone and anticyclone. For, simultaneous with the local elevation of temperature in the central region

of the cyclone, we have to consider a general diminution of temperature from the equator toward the pole. Therefore, the isosteric surfaces in which local depressions appear do not lie parallel to the earth's surface, but are depressed toward the equator. Therefore, the intersections of these with the isobaric surfaces that run approximately parallel to the earth's surface, as also the corresponding solenoids will, when projected on the surface of the earth, appear as shown in fig. 11. Most solenoids belong to the solenoid system that en-

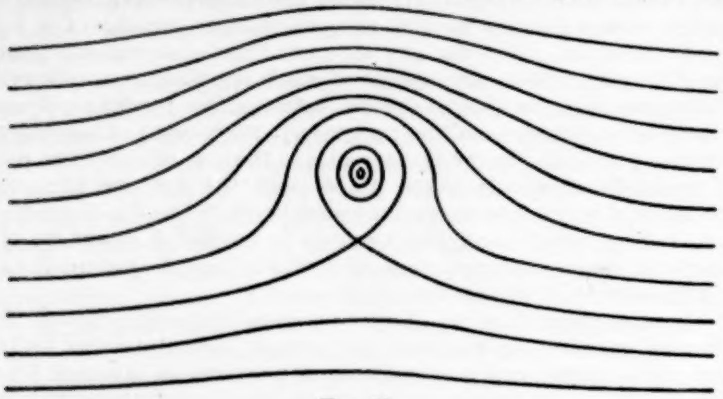

FIG. 11.

circles the whole earth; only in the cyclonic region do they have a deviation toward the polar side. Circular solenoids inclosed within the cyclones occur only in the central region, and only when the depressions in the isosteric surfaces are sufficiently deep. All other solenoids run as in fig. 12 where

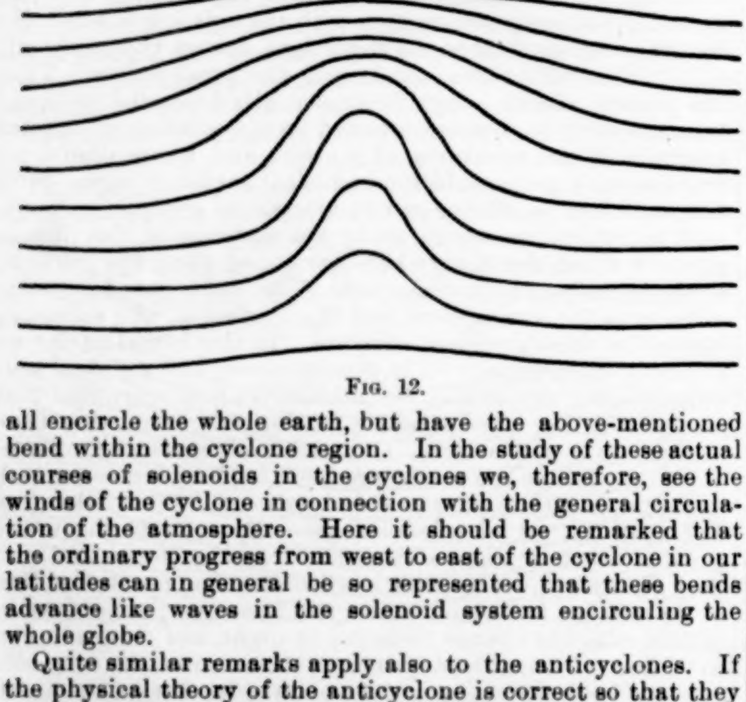

FIG. 12.

all encircle the whole earth, but have the above-mentioned bend within the cyclone region. In the study of these actual courses of solenoids in the cyclones we, therefore, see the winds of the cyclone in connection with the general circulation of the atmosphere. Here it should be remarked that the ordinary progress from west to east of the cyclone in our latitudes can in general be so represented that these bends advance like waves in the solenoid system encirculing the whole globe.

Quite similar remarks apply also to the anticyclones. If the physical theory of the anticyclone is correct so that they contain colder air than that of their immediate surroundings, then the solenoids surrounding the whole earth must show bends (curves) in the anticyclonic region which in opposition to the bends in the cyclonic regions must be directed toward the equator.

V.—CONCLUDING REMARKS.

In the preceding we have utilized our fundamental theorem for the purely qualitative discussion of the most important atmospheric movements. But the theorem itself is a quantitative one and, therefore, allows of an accurate quantitative investigation of the phenomena. However, it would certainly be premature to immediately use the theorem as the basis of extensive computations of atmospheric movements. The formal imperfection due to the fact that we have not considered the rotation of the earth and the friction would, for the present, prevent the numerical application. But this omission is not difficult to remedy so far as concerns the mathematics. The two generalizations already indicated in the introduction as necessary, where we take into consideration the friction and the rotation of the earth consist simply in this, that we supplement the right-hand member of the fundamental equation (6) by two terms, the first of which is the line integral of the frictional forces taken along the curve, and the second is the line integral of the deviating force due to the earth's rotation. But the most important difficulties are first met with in the applications themselves. For the frictional resistance depends on the relative velocities of particles of air lying near each other and a computation of the frictional resistance based on a rational principle would, therefore, demand a knowledge of the movement of the air, not from degree to degree, but from millimeter to millimeter. This circumstance shows that we must necessarily seek another way and that the indicated theoretical generalization will not have so great a practical importance as at the first glance we should have expected.

The value of the theory here described therefore does not consist especially in the formal possibility which it opens up of numerically following the atmospheric movements. Its great importance is rather to be sought in the fact that the theory gives a rational dynamic principle by which the facts of observation can be grouped. In this way we shall also provide the best foundation for a future quantitative dynamic meteorology. The problem will, therefore, always be simply this, to record the number and location of the solenoids and the corresponding distributions and intensities of the wind. We shall then, through experience instead of computation, learn how to take into consideration the earth's rotation and the atmospheric friction. In the case of periodic winds of short periods, such as the land and sea breezes or the mountain and valley winds that follow the alternations of day and night, we shall probably find that the actual circulation does not vary much from the values that are computed by our theorem, which neglects the rotation of the earth and the friction, since in these cases the work done by the solenoids consists essentially in overcoming the inertia of the masses of air. On the other hand, the study of the number of solenoids and the strength of the winds in the case of periodic winds of long period like the Monsoon, or the steady winds like the Trades, will probably lead us to a knowledge of the conditions of equilibrium between the moving forces represented by the solenoids and the resistances that arise in consequence of the state of steady motion. In cyclones we shall have occasion to study three stages: that of accelerating motion, where the inertia is the important resistance; that of steady motion, where the solenoids just suffice to maintain the movement that has been produced against the resisting forces; finally, the diminishing movement, where the resisting forces are overpowering. An accurate knowledge of cyclones from this point of view may be of special importance for weather prediction. From the number of solenoids we may conclude to what extent the wind will increase or decrease in intensity in the immediate future. Everything depends simply on whether we can obtain a sufficient number of systematic observations from the upper strata of air, and the technical details of this class of observations are already so far developed that it can no longer be doubted that the observations may be obtained with such regularity that they can be utilized in daily weather predictions.

In this connection I will further remark that the theory

here developed can be applied to the movements of the ocean just as to those of the atmosphere. In the ocean the temperature and the saltness play the same part in changing the density as do the temperature and the moisture in the case of the atmosphere. Eventually the theory also retains its applicability when we consider the atmosphere and the ocean together as one fluid medium. This is of great importance because of the extensive interaction between the movements of the air and of the ocean. Hence an excellent opportunity for the simultaneous solution of great meteorological and hydrographic problems will be afforded if the plans projected at the Hydrographic Congress in Stockholm in 1899 can be realized, so that the hydrographic expeditions sent out many times yearly by the participating nations can also carry meteorologists with instruments for the investigation of the upper strata of the air. In this respect the North Atlantic Ocean in the autumn and winter will offer especial interest. Perhaps it will here be possible to study the development of cyclones that probably often form over the region of the Gulf Stream, and therewith simultaneously measure the quantity of heat given out by the ocean and consumed in cyclonic formation.

THE PORTO RICAN HURRICANE OF 1899.

By C. O. PAULLIN, Nautical Expert, United States Hydrographic Office.

Soon after the occurrence of the Porto Rican hurricane of 1899, the United States Weather Bureau published a complete account of the passage of this storm through the West Indies and along the American coast. The daily maps of conditions over the Atlantic Ocean, compiled by the United States Hydrographic Office from the reports of its voluntary observers, make it possible to furnish some additional information of exceptional interest to meteorologists concerning this storm, both previous and subsequent to the period of its history covered by the Weather Bureau.

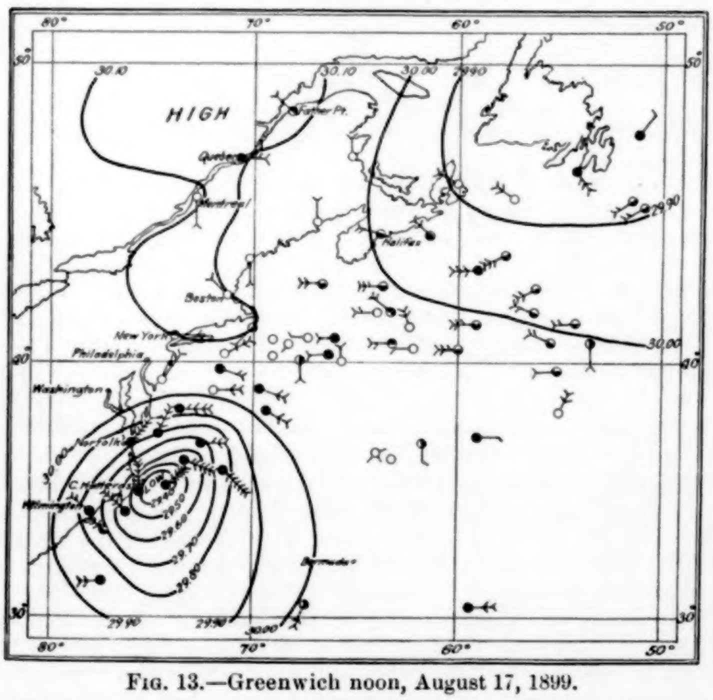

FIG. 13.—Greenwich noon, August 17, 1899.

The tropical storms of the North Atlantic generally originate to the eastward of the Lesser Antilles within the belt of calms which covers the ocean from latitude 5° to 15° north. Owing to the scarcity of observing vessels in this part of the Atlantic, and the relatively small area which the hurricane here attains, reports of these storms to the eastward of the fiftieth meridian are seldom received. Information concerning tropical storms at or near their place of origin is, consequently, almost wholly lacking, and much interest attaches to the report of the British steamship *Grangense*, which vessel encountered the late hurricane 1,800 miles east by south of the Island of Guadeloupe. The *Grangense* passed through the center of the storm and took very careful and complete observations, warranting the publication of her log in full, as follows:

At noon of August 3, when in latitude 11° 51′ north, longitude 35° 42′ west, we experienced a sudden change in the weather, which, being most unusual in this part of the world, is worthy of note. Early in the afternoon the barometer began slowly to fall from 29.93 inches. At 2 p. m. it stood 29.73, the sky becoming overcast with cumulo-nimbus clouds and the wind freshening to a moderate gale from north-northwest. At 4 p. m. the barometer read 29.53 inches, the wind remaining from the same direction with force increased to a fresh gale, accompanied with heavy rain. At 5 p. m. the barometer reached its lowest reading, 29.38 inches, while the wind fell calm and the rain ceased; very heavy nimbus clouds traveled overhead at a high speed from the southwest and a high, short, and dangerous sea from the northeast, caused the ship to pitch heavily and made it necessary to let her head fall off to the east in order to make headway, the ship being very light. At 6:30 p. m. a light breeze came out of the south-southwest and the barometer rose to 29.43 inches, clearly indicating that the center had passed. At 7 p. m. the wind increased to a strong south-southwest gale, with excessive rain beating down the northeast sea and enabling us to return to our course, northeast one-quarter east. At 8 p. m. the barometer stood at 29.58 inches, with a moderate gale hauling gradually southward. After two heavy squalls at 10 p. m. the weather cleared; barometer 29.73 inches, steadily rising; sea coming up from south-southeast; sky clearing and stars shining out again; strong breeze hauling to east. And so finished this little storm which showed all the symptoms of a genuine West Indian hurricane undeveloped, with the exception of the sea in the vortex, which, instead of being confused, came almost suddenly from the northeast, and remained from that quarter until the wind and sea from the receding semicircle overwhelmed it. Captain Spedding, who has been in this particular trade, from Europe to the river Amazon, for many years, and many others on board who have been long acquainted with these regions, say they have never experienced any weather of a cyclonic character so far to the eastward before.

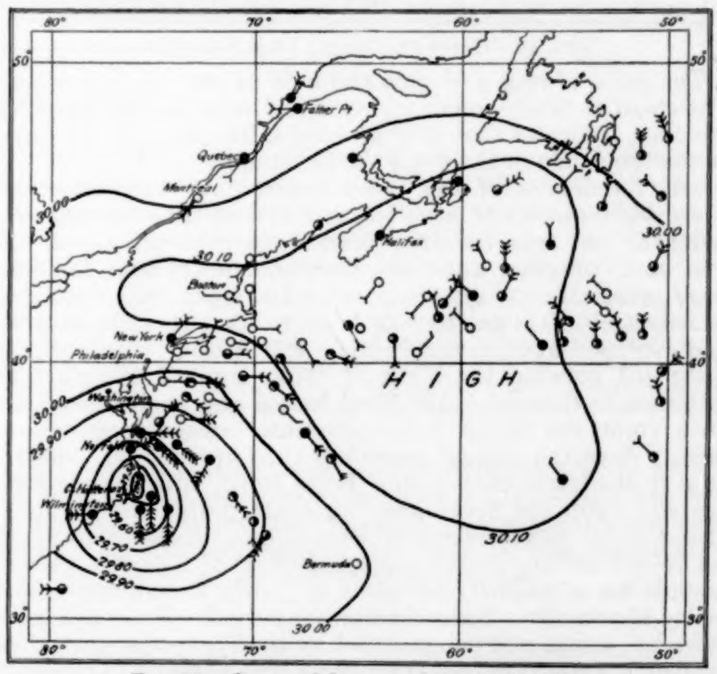

FIG. 14.—Greenwich noon, August 18, 1899.

From the foregoing log it appears that when the *Grangense* encountered the hurricane its development was not complete. The exceedingly low barometer which characterizes the tropical storm in its maturity was lacking, and neither the winds nor the sea had as yet attained dangerous violence. At the same time, according to the above account, this storm

"showed all the symptoms of a genuine West Indian hurricane undeveloped." There was a well defined storm area, with low barometer and calm center, and a complete cyclonic circulation of the winds, together with heavy rainfall. Four days later, when the hurricane reached Montserrat, the area of the storm had increased; the barometer was almost two inches lower, having fallen to 27.45 inches; the winds blew with hurricane force, causing immense damage and loss of life, and the rainfall was excessive. The storm which the *Grangense* encountered in its infancy had become the fully developed hurricane whose destructiveness will make it ever memorable in the annals of Porto Rico.

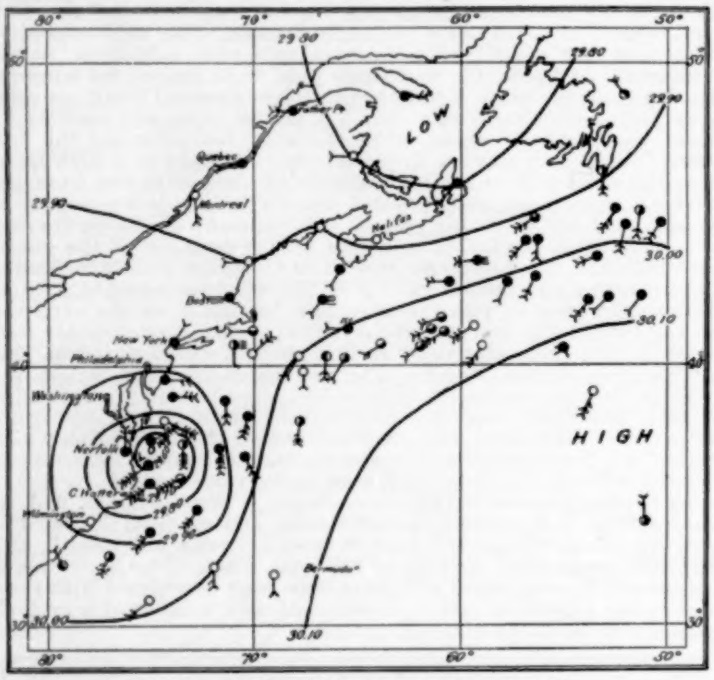

FIG. 15.—Greenwich noon, August 19, 1899.

The place of origin of this storm is as yet undetermined. The stage of development which it had reached on August 3, however, indicates that it originated as far eastward, at least, as the longitude of the Cape Verde Islands.

The hurricanes of the West Indies have been observed since the discovery of America, and lists of these storms covering the last four hundred years have been tabulated. It was not, however, until the present century that Redfield (and especially the international work since 1873,) collated sufficient observations to enable us to trace these hurricanes and ascertain approximately their life history. The period embraced between the birth of those tropical storms that originate to the east of the West Indies and their disappearance from the North Atlantic Ocean ranges from ten to twenty days, the average being less than fifteen days. Reference to the track of the late Porto Rican hurricane, which appears upon the accompanying chart, giving the positions of the center at successive Greenwich mean noons, shows that its length of life greatly exceeded that of any other whose records are sufficiently complete to justify a comparison and lasted almost three times the average period. From August 3, when the storm was encountered by the *Grangense*, until September 7, when it passed from the North Atlantic to the eastern coast of France, there is embraced a period of thirty-six days. This remarkable longevity has a close connection with the exceptional path of the hurricane and its slow velocity.

When the storm was reported by the *Grangense*, latitude 12° 40′ north, longitude 35° west, it was moving west by north. Its course gradually became more northerly, reaching a northwesterly direction in the Bahamas. Off the coast of Florida the storm recurved and was moving northeasterly in the vicinity of South Carolina. From August 3–7 the hurricane had a velocity of 20 miles an hour, and from the Lesser Antilles to Porto Rico, 16 miles. Between Porto Rico and the storm's position off the Carolinas on the morning of August 16 its rate of movement was 9 miles an hour, having suffered the usual retardation due to the American coast. Up to this point the storm's velocity and course may be considered normal, and it was to be expected that it would continue in a northeasterly direction, greatly increase in velocity and area, and move rapidly over the Grand Banks, disappearing to the north of the fiftieth parallel. Instead, the storm changed its course to north by west, slowed down during August 16–19 to a rate of 3 miles an hour, and remained practically unchanged in area. The recurving of the hurricane brought its center near the shore in the neighborhood of Hatteras, causing, for this reason, greater damage here than elsewhere along the coast of the United States, being specially destructive to shipping. On August 19 the storm moved seaward with increased velocity and with a general easterly direction. During the week of August 24–30 it remained almost stationary near the forty-fifth meridian, the center on August 26–28 shifting westward and northward. To the east of the Azores the storm curved northeastward, bending to southward near the fifth meridian west. On September 9 it was central off the coast of Provence, France, gales prevailed in this region until September 12, on which date the storm apparently had united with an area of low barometer covering southeastern Europe.

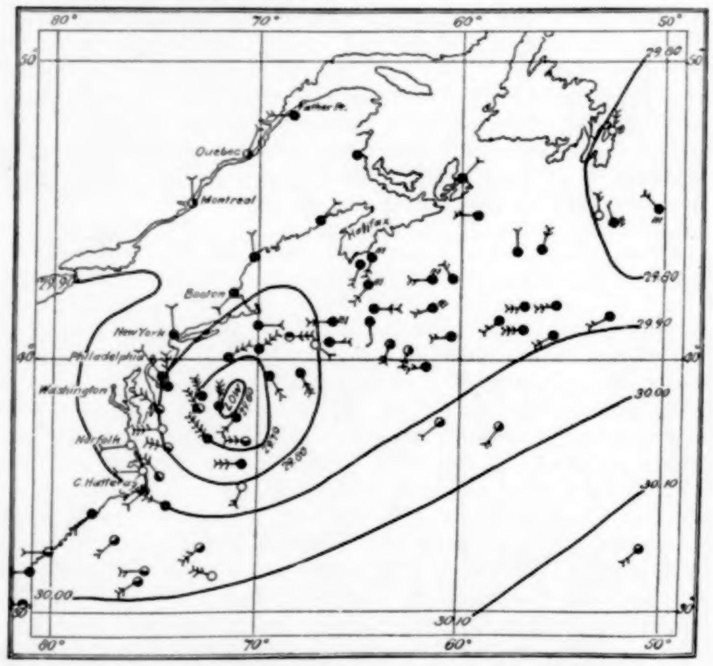

FIG. 16.—Greenwich noon, August 20, 1899.

Barometric readings below 29 inches and winds of hurricane force were frequently reported during the storm's passage through the West Indies and along the coast of the United States. Observations of the hurricane during its course in recrossing the Atlantic show a slight decrease in the violence of its winds and a diminution in the depth of the barometric depression, but one reading below 29 inches having been reported; however, whole gales and winds of storm force were still encountered. San Miguel, Azores, had a minimum barometric reading of 29.08 inches; the storm at this island caused much damage to property, besides with the reported loss of several lives. The log of the French steamship *Château Lafitte*, which vessel met the storm of September 6 in latitude 46° north, longitude 8° west, shows that on that date it

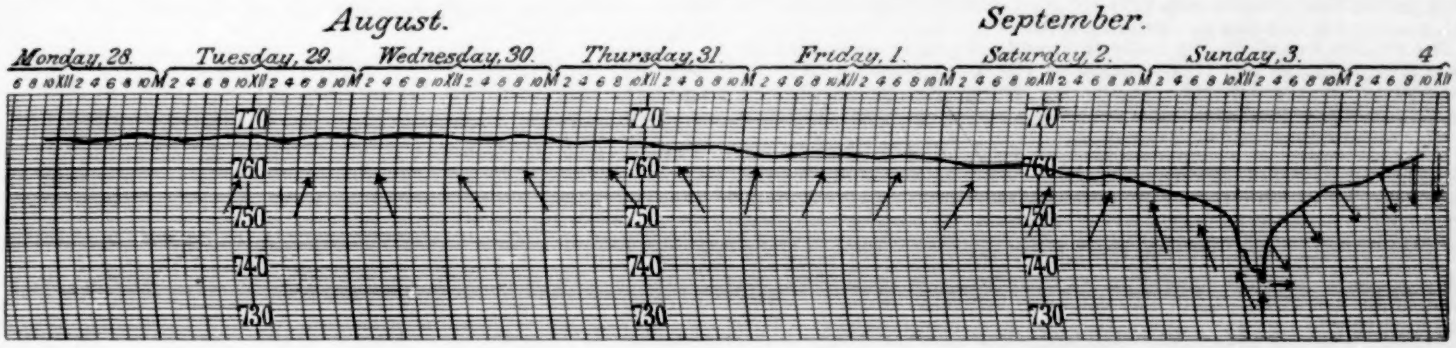

FIG. 17.

had lost but little of the severity which it exhibited within the Tropics. The *Château Lafitte* reports: "At noon the wind blew almost a hurricane from the southwest; sea very heavy from the same direction; barometer, 29.50 inches."

While the hurricane was central over the Lesser Antilles, the radius of the area within which the winds reached gale force was approximately 100 miles. Along the coast of the United States the radius had increased, ranging from 150 to 250 miles. In mid ocean the average radius was 200 miles, decreasing materially by the time the storm reached the coast of France.

The accompanying barogram, fig. 17, furnished the Hydrographic Office through the courtesy of Capt. F. A. Chaves, Director of the Meteorological Observatory at Ponta Delgada, San Miguel, Azores, shows the shifting of the wind and the movement of the barometer during the passage of the storm over that place. The barogram points to a still lower minimum for Ponta Delgada than the one given above. The storm apparently passed almost over this town, slightly to the northward.

The daily charts of Atlantic weather show that both off the coast of the Carolinas and between the fortieth and fiftieth meridians, where the movement of the center of the storm was slow and irregular, areas of high barometer were present to the northward. The conditions of the wind and weather in the former case are shown by the accompanying synoptic charts for August 17–20. (See figs. 13, 14, 15, 16.) The observations on these charts were taken at noon, Greenwich mean time, which corresponds to 7 a. m., local time, on the seventy-fifth meridian. The general track is shown on Chart XIII.

On August 15 an area of high barometer covered the Great Lakes and Ontario with a maximum reading of 30.35 inches. The decrease in the rate of the storm's movement was coincident with the southeastward passage of this high, as is shown by the synoptic charts. On August 17 the position of the high is directly to the north of the storm area. On August 20 the high had decreased in height and moved to the eastward of the fiftieth meridian; the storm had moved off the American coast and increased in velocity.

In these charts the isobars are drawn for every tenth of an inch apart. The following symbols are used: , clouds not given; , variable winds, force 2.

NOTES BY THE EDITOR.

THE WEATHER BUREAU AT THE PARIS EXPOSITION.

The Editor has received from Mr. F. J. Walz, in charge of United States Weather Bureau exhibit, an early proof of an article prepared by Mons. L. Barri, Adjunct Astronomer at the Paris Observatory, for publication in the Revue Scientifique. M. Barri makes an extended comparison between the daily publications of the Weather Bureau and those of the Central Meteorological Bureau of France. He says that the comparison between the two must be made indulgently in view of the fact that the funds at the disposal of the Weather Bureau are much larger than those available to our French colleague. Our daily weather map is more than six times as large as that of the French Bureau. The number of stations appearing on our weather map is nearly twice as many. The data given on it is nearly all presented graphically, while on the French map that which is missing is given in tabular form in the accompanying bulletin. The percentage of verifications of storm signals is nearly the same in France as in America, but in general the predictions do not extend so far in advance as do our own.

Mr. E. G. Johnson, assisting Mr. Walz, forwards an article contributed by Dr. Henry de Varigny to Le Temps of September 13, in which he praises the work of the Weather Bureau of the United States and the graphic view of its organization that one obtains from its exhibit at the Exposition of 1900. After describing quite completely the daily processes of observation, enciphering, telegraphy by the circuit system, deciphering or translation, the production of maps both manuscript and printed, and the distribution of weather predictions and storm warnings. He says:

> No one can ignore the fact that the work of the Weather Bureau is very helpful in the prediction of the weather in Europe, since the weather advances from west to east, and it is from America that the areas of low pressure, which extend rapidly, come to us and make confusion in our meteorology. It is the same in the United States, the future weather is determined by the conditions that prevail in the western portion of that continent.

Although this latter statement by Varigny may in general be true, yet the practical work of daily forecasting has long since shown that one has to keep a steady watch northward, southward, and eastward for the perturbations that disturb the progress of the weather from west to east.

In a detailed report by Mr. F. J. Walz, dated October 18, 1900, and after giving a very full catalogue, filling ten pages, of the Weather Bureau exhibit at the International Exposition of 1900, he says:

> The United States Weather Bureau exhibit was installed during the month of April and opened to visitors for inspection in completed condition May 15. The building remained open and the exhibit accessible to visitors every day, except Sundays, from 9 a. m. to 6 p. m. during the time from May 15 to September 30, and from 9 a. m. to 5:30 p. m. during the month of October. It was necessary to close a half

hour earlier during the month of October on account of darkness, there being no way of lighting the building artificially.

The exhibit was visited by many thousands of people, among whom were meteorologists and those interested in related sciences from all parts of the civilized world. The cloud photographs, the method of making weather forecasts, and the kite and aerial apparatus attracted special attention.

Many interested in aeronautics and air explorations examined the kite exhibit in detail, taking photographs and measurements of the kite, instruments, and apparatus. Notably among these were a number of officers of the German, French, Italian, and Japanese armies and navies.

During the meeting of the International Meteorological Congress, which brought to Paris representative meteorologists from nearly all parts of the world, a special invitation was extended to its delegates and members to visit and inspect the Weather Bureau exhibit. This invitation was accepted, and, therefore, the exhibit brought the methods, instruments, etc., of the United States Weather Bureau to the attention of those most interested in meteorological work.

It was the special effort of those connected with the exhibit to explain and set forth in the strongest and clearest light possible the aims and methods of the United States Weather Bureau, and its practicability and great economic value to the people of the United States and of North America. Special stress was given to the great importance and the value of its weather forecasts and warnings.

It is to be regretted that on account of the expense and lack of funds for the necessary cablegrams the daily weather map of the United States, as originally planned, could not have been printed and issued daily[1] in connection with the exhibit. It is also to be regretted that a concise pamphlet or catalogue of the exhibit could not be prepared and printed for distribution, as there was a great demand for something of this kind.

As a result of the visit of the Jury of Awards and their critical examination of our exhibit the United States Weather Bureau was awarded a *Grand Prix*. Gold medals were awarded to two officials of the Weather Bureau, viz: Prof. C. F. Marvin for instruments, apparatus, and appliances, and to Prof. A. J. Henry for cloud photographs.

THE PROCEEDINGS OF THE PERMANENT INTERNATIONAL METEOROLOGICAL COMMITTEE.

From Professor Hildebrandsson, the new Secretary of the Permanent International Meteorological Committee, we have received the printed proceedings of the session of September 15. The committee elected Messrs. Pallazzo of the Central Office at Rome and Shaw of the Meteorological Office in London as new members to replace Messrs. Tacchini and Scott. Professor Hildebrandsson was elected Secretary of the committee. Professor Rucker was elected President of the Magnetic Committee. The directors of magnetic observatories are invited to send regularly to the secretary a list of the days that they consider to have been magnetically calm; these lists will be distributed. The cloud committee expresses the wish that the directors of meteorological observatories shall make simultaneous observations of the clouds at periods to be fixed in advance by the committee on aeronautics.

The committee on aeronautics expresses the opinion that it is desirable that military establishments for ballooning and meteorological institutions in general, be invited by their respective governments to participate in these international ascensions; this request will be communicated by the French Government to all other nations through diplomatic channels.

The subcommittee on telegraphy recommends the following: By reason of the advantages already obtained by extending the radial (i. e., circuit) system into neighboring countries, the subcommittee has decided to propose to the International Meteorological Committee to take the proper steps to form, as soon as possible, a committee composed of official representatives of the participating states, and instructed to confer with the international telegraphic bureau at Berne in order to find the most appropriate means of improving the service of meteorological dispatches.

[1] This will, however, be done at the Pan-American Exposition to be held at Buffalo in 1901, when a complete exhibit of the magnitude and importance of the work of the Weather Bureau will be made.—ED.

OSCILLATIONS OF LAKE LEVEL.

Referring to Professor Henry's article in the MONTHLY WEATHER REVIEW for May, Prof. F. A. Forel, of Morges, writes to him as follows:

I am very much pleased with your excellent study on the frequent lowerings of the level of Lake Érie, caused by the winds. On our Lake Leman, where the local conditions are less favorable, I have not observed a similar change of more than 12 centimeters. (See Leman, Vol. II, p. 29.) You found, the 25th of May, 1900, a change of level of 25 centimeters. This is superb.

However, what interests me still more are your seiches, viz, the balancing oscillations in the water of the lake as a whole. You give very fine examples of uninodal oscillations, with opposing balancings at the two extremities of the lake on the 27th, 28th, and 29th of March; duration of the period about fifteen hours.

On the other hand, on the 26th and 27th you observed a binodal oscillation with parallel movements at the two extremities of the lake, consequently with a node in the middle of the lake; duration of the period about ten hours.

I am very much puzzled by this strange relation of ten to fifteen hours in the duration of the ninodal and binodal periods; according to theory the relation should be as 1 to 2. But in practice we obtain slightly different relations, sometimes larger and sometimes smaller: Lake Leman, 2.07; Lake Constance (Boden See), 1.98; Lake Zurich, less than 2.00; Lake George, 1.82; Lake Lucerne (four Cantons), 1.83, etc. (See Leman, II, p. 162.) But so large a difference as that of Lake Erie (1.5) we have never yet observed.

I am also very much astonished to see the rapidity with which the binodal oscillation disappeared on the evening of March 27. There was again a slight trace on the Buffalo curve at 10 p. m. of the 27th, then all vanished and gave place to a simple uninodal oscillation. In our lakes, Leman in particular, the series of seiches continue much longer.

I have just tried to apply the computations of P. du Boys (Leman II, p. 83) to your Lake Erie, basing my calculations on the hydrographic chart which you sent me. I obtained for the uninodal seiche 16.9, which is a little more than the rises of the 28th of March give us, but the difference does not exceed the limits of error of this method.

Your observations are very interesting; they give us the *longest oscillations that have ever been accurately measured up to the present time on any body of water*, 400 kilometers, following the curves of the principal axis of the lake. I shall rejoice to see the continuation of your observations on this subject. If you could have made for me some tracings of the finest series of your uninodal and binodal seiches they would be of great interest to me as well as to those of my colleagues among the Swiss naturalists who are studying the phenomena with me.

I should very much like to be able to send you the memoirs published by myself on this phenomenon, but unfortunately the supply of most of them is exhausted. I have not more than four or five to send you. You will, however, find a general and complete summary of my theory on seiches in Volume II of my monograph: Le Leman, pages 39-213.[1] I can but believe that this work will be found in some one of the libraries in your city, and that you can have access to it.

CORRECTION.

Dr. N. E. Dorsey requests that the words "of the atoms or corpuscles," unfortunately inserted by the Editor, and overlooked in correcting the proof, (September REVIEW, page 383, column 2, line 14) be struck out. "On the elastic solid theory of light the luminiferous ether is treated as a *continuous* medium; not as one composed of discrete particles as the words atoms or corpuscles imply."

WEATHER BUREAU MEN AS INSTRUCTORS IN METEOROLOGY.

Since preparing the article on this subject published in the MONTHLY WEATHER REVIEW for August we have received several additional letters, from which we make the following extracts:

Mr. B. S. Pague, Local Forecast Official, says:

I engaged in the work of public lectures in the autumn of 1889, when my first address was at a Farmers' Institute held in Oregon City, Clacka-

[1] F. A. Forel. Le Léman. Monographie Limnologique. T. I., 1892; II, 1895, and Tome III in preparation. Lausanne, Librairie Rouger.

mas County, Oreg. During the winter of 1889-90 I delivered several addresses at farmers' institutes, and during the following nine years made many such addresses, principally in the State of Oregon. In 1893-94 I delivered a lecture at Stanford University, Cal., one at the State University of California, and one at Santa Clara, Cal., in addition I made some four or five addresses of a more popular nature before the Normal School, High School, Academy of Sciences, &c., in San Francisco. The lectures at Stanford and at the State University were the first delivered at these places by a Weather Bureau official. For the lecture at the State University I had some 30 or 40 stereopticon slides made from daily weather maps, and these I used to illustrate my lecture; these slides are now used by the official in charge of the San Francisco office, for illustrated lecture work. From 1894 to 1900 I made many addresses in Oregon on the subject of The Weather Bureau and its Work. I have addressed the students of the State Agricultural College of Oregon on various occasions, the State Grange, the great summer Chatauqua meetings at Gladstone, Oreg., farmers' institutes, dairy meetings, horticultural meetings, State, county, and district fairs, stockmen's conventions, fishermens' conventions, miners' conventions, State medical conventions, Pacific Coast Dental Association, Fruit Growers' Union, chambers of commerce, boards of trade, and academies of science. These lectures covered a wide range, but all showed the direct effect which the Weather Bureau has upon all industries.

In addition to the foregoing I made a specialty of having classes from public schools, colleges, etc., visit the office at Portland, Oreg., when instruments were shown and the practical work of the Bureau thoroughly explained.

* * * * * * *

I have at the present time several invitations to make addresses in this city, Detroit, Mich., three of which I shall now mention: One to be delivered as one of a course of lectures given in the auditorium of the Masonic Temple, under the auspices of the chapter masons, to masons and their friends; the second before the Unity Club of the Unitarian Church, being one of a course of lectures on various subjects under the general title The Progress and Development of the Century, my subject being Meteorology, and the third to be given before the teachers of the public schools in this city.

Mr. John R. Weeks, Observer Weather Bureau, writes from Fort Smith, Ark., saying that a series of lectures on meteorology and especially cloud forms, is being arranged for by Prof. J. E. Hallimen, instructor in physical geography at the high school. Mr. Weeks adds that this is the first year that such work has been undertaken in this city, and that this awakened interest in the work of the Bureau "has been without any suggestion or solicitation on my part, although it had been my intention to broach the matter as soon as opportunity offered."

Prof. H. J. Cox, in charge of the Chicago station, says:

In the three higher grades of the Chicago public schools instruction is given by the teachers each morning upon popular and elementary meteorology, and in the high schools, during the course, in physiography. Professor Salisbury, at the Chicago University, gives lectures upon meteorology and uses Professor Davis's meteorology as a textbook. J. Paul Goode also delivers lectures upon the subject at the university during each summer quarter. Other schools and private academies in this city give much attention to the subject, and during the entire instruction the daily weather maps are furnished by this office; sometimes, in special cases, as many as fifty per day have been furnished for a period of a week. These classes almost invariably come to this office for additional instruction, and it is not unusual, as often as once a week, for either myself or one of my assistants to give a lecture at the Weather Bureau upon the subject of forecasting, the movement of storms, and the working of the instruments, to these visiting classes. In fact, the demand for this instruction has been so great that it has been found necessary to curtail these visits to some extent, as they interfere with the office work.

For several years it has been the custom for the officials of the Chicago office to give lectures before various societies in this city. Last winter Mr. Linney delivered a lecture before the Chicago Geographic Society, and I gave an informal talk before a South Side school about the same time. I have accepted an invitation from the Chicago Academy of Science to deliver a lecture next January. Such work, while important in itself, can not well be extended without interfering with important Weather Bureau work. We give encouragement to those who desire to study the science, and we feel that there is great interest taken in the subject in this city.

I may say, in conclusion, that I was probably the first observer of the Weather Bureau who gave regular instruction and lectures upon meteorology at an institution of learning. During the years 1887 and 1888, while at Northfield, Vt., I was a member of the faculty of the Norwich University, and inaugurated a course in meteorology, which has been continued to the present day.

Mr. S. S. Bassler, Local Forecast Official at Cincinnati, reports that the schools in Cincinnati, now under the superintendence of Dr. R. G. Boone, are taking a lively interest in meteorology, in connection with "nature studies." He has prepared a short paper on this subject, to be read on December 4. He will also speak before the teachers of Bellevue, Ky., on December 14, 1900, and in Covington, Ky., in February, 1901.

Mr. W. M. Fulton, Observer in charge, Knoxville, Tenn., addressed the farmers' institutes at Rogersville, Tenn., in October, and again the institute at Newmarket, Tenn., on November 9 and 10.

TRAINING NEEDED TO BECOME INVESTIGATORS.

It is a very common mistake to think that education consists wholly in learning at school or college all that is worth knowing relative to the past achievements and present condition of knowledge. Those who have thus acquired eminent attainments in knowledge receive the college degrees of B. A. or M. A., and enter upon active life with far greater mental resources than those who have not been so highly privileged. Their knowledge stands them in good stead in both their social and business relations. But there is another much smaller class of students who desire, not merely to learn about all that is known but also to add to our knowledge. They propose not to be merely merchants or teachers, or popular writers and lecturers; they are not content with the field of applied science, but aspire to be original investigators, and to push forward the conquests of man over the hidden laws of nature. Every one must now recognize that the whole creation is an assemblage of problems in physics, and that we as yet know but little compared with what there is still to be found out. The inventions, and the arts that constitute our modern civilization, are but the inevitable application to human needs of the knowledge that the investigator has wrested from the secret chambers of nature. Those who contemplate becoming investigators in any field of science should, if any way possible, take the courses of instruction that are offered in most of our larger universities known as post graduate courses, and which usually lead to the degree of Doctor of Philosophy or Doctor of Science; these degrees should never be given as honorary titles. The importance and character of the training required for these degrees is enthusiastically described in the following article by Prof. Paul C. Freer of the University of Michigan, which we copy from the Michigan Alumnus for March, 1900, pp. 238-240:

A fundamental misconception of the meaning of research work is too often apparent. Untrained beginners are set at some hackneyed problem which involves little thought on their own part or on that of the proposer, and no knowledge of the general aspects of the subject; the results, even if the ultimate end is accomplished, being of little value to science as a whole—and yet these tyros are told that they are, and suppose themselves to be, engaged in original investigation. For this reason all competent workers should continually reiterate the fact that training of the most careful and conscientious kind, not only in the immediate subject of interest, but also in all of the branches related to it, must always precede any endeavor to enter into new and untried paths. The better the preliminary education the better the results, provided always that the worker has the proper capabilities and enthusiasm. If the impulse and spirit are lacking the attempt to do anything had better be abandoned. No good ever came from compulsion either from without or within.

True research does not occupy itself merely with the observation of a few details which of necessity suggest themselves in conjunction with any subject, but it must also connect the facts which it has estab-

lished with those observed by others, in such a way that the results will form a portion of the whole structure of science. In other words, the investigator must be able to generalize or do hack work. Without generalization there would be no sciences, and the present comity existing between kindred disciplines would be absent. Observations, however carefully carried out, are not research, and it is wrong to call the mere observer a research worker.

The logical result of the above argument is that the student, in order to accomplish anything as an original worker, must clearly realize the necessity, not only of a thorough understanding of his own subject and of the allied branches, but also the importance of a good substratum of general culture. The more a man has used his brain as an apparatus for thinking, the more he will be able to do in research. For this reason the undergraduate should not be too anxious to specialize. Let him, perhaps during his four years' course, obtain some insight into the underlying facts and theories of his chosen science, but, of all things, let him beware of neglecting the opportunity of familiarizing himself with the world which surrounds both him and the subject to which he intends to devote himself.

The undergraduate who really means to accomplish something, makes no greater mistake than to suppose himself able to do without graduate work. All beginners are dependent on their teachers, the advanced student should learn to depend upon himself, and this end can only be reached after the necessary preliminary routine is completed.

An undergraduate can not be expected to master the necessary details of a profession. He must and will be an amateur. If he really loves the subject he has chosen he certainly should be willing and anxious to prepare himself for further development by graduate study. Here, too, the brief time given to obtaining the master's degree is not sufficient for any valuable results in research; nor, indeed, if the student has properly used his time during the preliminary period of training, will he be prepared to properly launch himself in the higher fields of original investigation. He had far better devote the interval given to the intermediate degree to acquainting himself with the necessary details of his chosen subject, with its relations to other sciences and to gaining as good an insight as possible into its literature and history. In this way the worker will discover in what portion of the field an original investigation can be carried on, understand its relative importance, and comprehend the way in which it is related to the whole structure of which it is to form a part. A man so trained may do something worthy of the doctorate and also worthy of the vast field of scientific thought into which he has entered.

Above all, no one should strive to begin scientific work actuated solely by mercenary considerations. The question is too often asked: Where can I apply this to some practical end? How can I make money out of this subject? No more blighting influence to scientific development can be imagined. It deprives science of the very essence of its existence—the universal comity of knowledge—it changes that which might be for the good of all into something for the benefit of the individual pocketbook; it retards rather than accelerates growth. The history of each individual case is but a repetition of the universal history of science. A premature attempt to apply what he has acquired to practical ends simply results in robbing the student of his power for further development. It leaves him where he stands for all time to come, and his more studious brethren will soon pass and distance him, regardless of the fact that his immediate pecuniary gain may be greater.

The sciences of to-day form a body of great generalizations, none of which have come to us through the efforts of one man; they are, on the contrary, a result of gradual growth in each step of which the mental acumen of some investigator, perhaps long since dead, can be seen, and each research of to-day is built upon some perhaps equally great one of yesterday. Science is a stern mistress who gives of the best within her only to those who follow her unflinchingly, however difficult the task, however remote the prospect of pecuniary gain or of self-aggrandizement, their sole hope being that they, too, may add to mankind's knowledge of truth, so that future generations may profit by the sacrifices of the present. This has been the spirit of the past; it must also be the spirit of the present and of the future. Science is moving onward, swiftly, relentlessly, unflinchingly; no half-hearted followers for her; the weak fall by the wayside; there is no place for those who have not the patience to acquire the necessary knowledge. The strong press forward in fierce rivalry, each striving for the ultimate goal, a perfect human knowledge by which from any given premises the logical conclusion may be drawn with unerring accuracy.

CLIMATE AND FLORA.

Mr. Thomas H. Kearney, Jr., has published in Science a series of articles on the plant geography of North America. In that journal for November 30, Vol. XII, pp. 840–842, he gives expression to some of the "conditions of climate and soil which permit the actual existence of numerous lower austral forms in juxtaposition to a transition and even Canadian flora." He believes the factors that have the largest effect in determining the zonal distribution of organisms are (1) the normal number of days during the year which possess a temperature of the air above 6° C., or 43° F.; (2) the normal sum total of temperatures above 6° C.; (3) the normal mean of the six consecutive hottest weeks. The following table gives the values of this data for four stations in the mountain region and two of the most northern stations in the Austro-riparian area. The two additional factors of importance, permitting species to maintain themselves in what would seem to be an unfriendly environment, are (4) the amount of insolation as to duration and intensity; (5) the nature of the soil. As the items 1–4 are already computed for many Weather Bureau stations, it would seem possible to make an extended inquiry along the lines suggested by Mr. Kearney.

Stations.	Altitudes.	Days with temperature above 43° F.	Sum total above 43° F.	Normal mean of six hottest weeks.
	Feet.	*Days.*	° F.	° F.
Highlands, N. C	3,817	234	3,547	66.1
Asheville, N. C	1,981-2,250	249	4,688	71.3
Knoxville, Tenn.	891- 933	267	5,563	76.1
Valleyhead, Ala	1,027	293	5,488	75.2
Norfolk, Va	11- 12	295	6,047	79.3
Memphis, Tenn	117- 273	307	6,754	81.0

HEAVIEST RAINFALL AT LA CROSSE, WIS.

Mr. R. H. Dean, Observer, Weather Bureau, at La Crosse, Wis., reports that the rainfall on the 27th and 28th exceeded all previous records for twenty-four hours at that station. He has compiled the following table, showing the amount and date of the greatest daily rainfalls in each month since 1871, inclusive. The record of 7.23 inches on October 27–28, 1900, occurred in twenty-two hours and eighteen minutes, between 10:12 a. m. of the 27th and 8:30 a. m. of the 28th:

	Inches.
January 28 and 29, 1891	1.32
February 27, 1876	1.10
March 27, 1880	2.05
April 27 and 28, 1889	1.66
May 14 and 15, 1900	1.90
June 11 and 12, 1899	4.91
July 14, 1900	4.12
August 7 and 8, 1889	4.25
September 6 and 7, 1884	5.69
October 29 and 30, 1896	2.41
October 27 and 28, 1900	7.23
November 10, 1880	1.74
December 24 and 25, 1895	2.11

METEOROLOGICAL CABLEGRAMS.

On page 248 of the MONTHLY WEATHER REVIEW for June, 1900, we have given in full the title of the Atlantic Cable Directory for the convenience of those who have occasion to transmit to the Weather Bureau meteorological information from foreign countries by cable or telegraph. As this work is no better known than several other systems of cable cipher, we append also the following titles of other works, and would say that any dispatch for the Weather Bureau may be sent in any system of cipher that is most convenient to the author, provided it has been published, with confidence that the Weather Bureau will be able to decipher it as all ordinary cable codes are at hand or available for this use. Among the codes most used in America and Europe are the following:

No. 1, The Atlantic Cable Directory, already referred to.

No. 2, Western Union Telegraphic Code and International Cable Directory, compiled and published by the International

Cable Directory Company, New York. Cable address, "Incadice," Telephone, 1555 Broad. Copyrighted in the United States and registered in Great Britain (entered at Stationers' Hall); 1899.

No. 3, The A B C Universal Commercial Electric Telegraphic Code, specially adapted for the use of financiers, merchants, shipowners, brokers, agents, etc.; multum in parvo; simplicity and economy palpable; secrecy absolute, by W. Clauson-Thue, F. R. G. S.

Fourth Edition, London: Eden Fisher & Co., 50 Lombard street and 97 Fenchurch street, E. C., 1883. Registered in Great Britain and Colonies, United States, Belgium, France, and Germany; all rights strictly reserved. Price 15s.; or, interleaved with plain paper, 20s. net. By Parcels Post, 15s. 6d. By Continental Book Post, 16d. or 21s. 6d. An india rubber stamp is given with each book.—A B C Code used.

No. 4, Lieber Code. Published in English and French by the Lieber Code Co., New York and London. Cable address "Rebeil." Copyrighted in the United States, and registered in France, Great Britain, and colonies. Especially adapted for banking, mining, legal, shipping, and mercantile business. A rubber stamp given to each code.—Lieber's Code used.

It contains 75,000 code words consecutively numbered.

Every three months a list up to date of those having the code is sent to all purchasers.

PSYCHROMETRIC TABLES.

In the MONTHLY WEATHER REVIEW for August, page 333, Mr. W. H. Alexander states that Molesworth's psychrometric tables were used by his correspondents in reducing their observations of the wet and dry bulb thermometer. In reply to an inquiry by the Editor, Mr. Alexander states that he has not been able to find a copy of these tables in St. Kitts, but has obtained a manuscript copy of the table actually used under Mr. Watts's direction. This is copied from Hurst's Handbook for Surveyors, and is identical with the tables of dew-point factors published by Glaisher in 1856, and which the reader will find reprinted on page 144 D of the Smithsonian Meteorological Tables, third edition, 1859. These factors are still used by English observers, and, in some cases, give approximate results if the psychrometer is not ventilated or exposed to a strong wind. In order to obtain the best results with the psychrometer, it must be ventilated at the rate of 5 to 10 feet per second and the corresponding tables first prepared by Ferrel and slightly amended by Assmann, Svensson, Marvin, and others must be used.

OBSERVATIONS DURING THE SOLAR ECLIPSE.

The observations at one hundred and fifty-four meteorological stations in India recorded during the solar eclipse of January 22, 1898, have been discussed and published by Mr. John Eliot, the Director General of Indian observatories, in a recent Indian meteorological memoir. The observations included the temperature of the air, barometric pressure, relative humidity, cloud and rainfall at all stations and solar radiation observations at six stations. The solar radiation thermometer is so much affected by the radiation from the surrounding inclosure and by the wind, as well as by its own sluggishness, that it must not be considered as an instrument for measuring solar radiation proper, but may, possibly, give us a fair indication of the changes in temperature of leaves and other objects exposed to the sunshine. The difference between the readings of the solar radiation thermometer and the dry bulb or air temperature in the shade, were directly proportional to the area of the unobscured portion of the disc of the sun. The temperature of the surface of the ground was observed in isolated cases; the amplitude of the change in the interior of India was from 12° to 20° at the time of maximum obscuration. The temperature of the air diminished in proportion to the obscuration and amounted to 8° in the interior of India near the path of total eclipse. The maximum reduction of temperature was 12° at Karwar and the epoch of the greatest diminution of temperature averaged about twenty-three minutes later than the epoch of greatest obscuration. Mr. Eliot suggests that this large amount of retard may have depended somewhat upon inaccurate observations in the dim eclipse light, but it was practically the same over the whole area in which the sun's disc was obscured by eight-tenths or more. With regard to the barometric pressure Mr. Eliot states that there was a steady increase of pressure proceeding at a nearly uniform rate during the first stage of the eclipse; there was little or no variation during the second stage and, finally, during the restoration of sunlight an increase of pressure that continued after the termination of the eclipse.

The chief effects of these actions were (*a*) to decrease the amplitude of the diurnal variation on the day of the eclipse by amounts averaging about 0.035 inches in and near the belt of totality; (*b*), to accelerate the epoch of the afternoon minimum of the diurnal oscillation on the day of the eclipse by intervals averaging about forty-five minutes. The motion of the air was very considerably modified in amount and intensity, but not in direction; it fell off very rapidly during the first stage and was feeble during the greater part of the second stage. Light airs and calms prevailed during the time of greatest obscuration at an hour when the diurnal variation of the wind gives us the greatest velocity. At the majority of stations and near the belt of totality a short sudden gust occurred at twenty minutes after the commencement of the eclipse. This is shown at a large number of stations; the recorded velocity of the gusts varied between 10 and 26 miles per hour; at the first class stations the gust occurred one or two hours before the eclipse at 3 stations, but after the beginning at 10 stations; the gusts show a fairly regular progress from west to east. At twelve second and third class stations, in or near the belt of totality, the gusts occurred before the eclipse in four cases. On the average of all the 38 stations at which anemometers were used the mean air movement between 1 and 2 p. m., was only a third of that which prevailed during the preceding hour, and was even less than the movement in the early morning hours at the time of the diurnal minimum wind. In general, a series of gusts occurred about twenty minutes after the commencement of the eclipse and another series about half an hour after totality. The day was remarkably clear, and the atmosphere steady, and upward convective movements were feeble, more especially during the eclipse, when they were *nil*. There was a large and rapid increase of the pressure of aqueous vapor, and hence also of relative humidity commencing on an average about twenty minutes after totality, followed by an equally large and rapid decrease for about thirty minutes. This oscillation occurred at all stations without exception during the second half of the eclipse and was the most remarkable and unexpected phenomenon of all. The data at hand show clearly that this oscillation in humidity was transmitted from west to east with approximately the same velocity as that of the shadow of the moon; it was not due to an actual horizontal movement of the air, but passed across India with the shadow itself. It could not have been due to the ordinary processes of evaporation or diffusion of moisture, or to the slow horizontal movement of the air, as shown by the anemometer; the only action which could give rise to this oscillation is the descent of masses of air containing a larger quantity of aqueous vapor than the air at the surface. Mr. Eliot considers

that this moist air existed as a stratum a little way above the ground, and that it descended to the earth because of the lower temperature in the eclipse area, as compared with the areas in front and rear.

As the moon cuts off the heat of the sun from the earth and its atmosphere quite rapidly during an eclipse and as totality itself lasts only from one to five minutes, the atmospheric changes as to pressure, temperature, moisture, and wind go on so rapidly, even though they be but slight, that we need very sensitive apparatus in order to measure them accurately. The temperature of the dry and wet thermometers follows the corresponding temperature of the air too sluggishly to be of much value in these delicate researches unless the thermometers are thoroughly well ventilated or whirled. Anemometers are notoriously sluggish. In general, we think that the diminution of the vertical convection current due to the cooling of the ground suffices to explain the diminution of the wind, while the subsequent warming of the ground and renewal of convection currents should explain the gusts that followed. The diurnal variation of the wind must, according to the simplest laws of hydrodynamics, produce a corresponding diurnal variation in the barometric pressure.

LANTERN SLIDES FOR LECTURES.

In order to respond to the increasing demand for lantern slides for the use of Weather Bureau officials in their lectures, the Chief of Bureau has ordered that such be prepared and sent to those who are giving lectures that require such illustrations. Many of the teachers and others who receive the MONTHLY WEATHER REVIEW doubtless have seen or perhaps possess such slides, and the committee appointed by the Chief to make the selection would be glad to hear of any that are esteemed as particularly effective or instructive. Those who desire slides on particular subjects or have any suggestions to make relative to the proposed series are invited to submit their views. It will, of course, require some months to complete the execution of this work.

POGONIP.

In the MONTHLY WEATHER REVIEW for 1894, page 76, the Editor has given some account of that mist or fog of frozen vapor that is called by the Indian name pogonip. It is there spoken of as recurring frequently in the southeastern part of White Pine County, Nev.; but the following item from Ainsley's Magazine, as reprinted in the Washington Evening Star of October 27, 1900, gives further interesting information.

This phenomena occurs most frequently in the northern part of Colorado, in Wyoming, and occasionally in Montana.

About two years ago a party of three women and two men were crossing North Park in a wagon in the month of February. The air was bitterly cold, but dry as a bone and motionless. The sun shone with almost startling brilliancy. As the five people drove along over the crisp snow they did not experience the least cold, but really felt most comfortable, and rather enjoyed the trip. Mountain peaks 50 miles away could be seen as distinctly as the pine trees by the roadside.

Suddenly one of the women put her hand up to her face and remarked that something had stung her. Then other members of the party did the same thing, although not a sign of an insect could be seen. All marveled greatly at this. A moment later they noticed that the distant mountains were disappearing behind a cloud of mist. Mist in Colorado in January. Surely there must be some mistake. But there was no mistake, because within ten minutes a gentle wind began to blow, and the air became filled with fine particles of something that scintillated like diamond dust in the sunshine. Still the people drove on until they came to a cabin where a man signaled to them to stop. With his head tied up in a bundle of mufflers, he rushed out and handed the driver a piece of paper, on which was written: "Come into the house quick, or this storm will kill all of you. Don't talk outside here."

Of course no time was lost in getting under cover and putting the horses in the stables. But they were a little late, for in less than an hour the whole party was sick with violent coughs and fever. Before the next morning one of the women died with all the symptoms of pneumonia. The others were violently ill of it, but managed to pull through after long sickness.

"I saw you people driving along the road long before you got to my house, and I knew you did not know what you were driving through," said the man, as soon as the surviving members of the party were able to talk. "That stuff you saw in the air was small particles of ice, frozen so cold that it goes clear down into the lungs without melting. If one were to stay out a few hours without covering his head he would surely die. One winter about eight years ago a whole Indian tribe across the Wyoming line died from its effects. The Indians are more afraid of it than they are of rattlesnakes, and call it the 'white death.'"

THE LONG RECORD OF MR. S. P. DAVIDSON.

Mr. B. L. Waldron, Observer Weather Bureau, Columbus, Ohio, writes that Mr. Samuel P. Davidson, of London, Ohio, has maintained a complete record of temperature and rainfall, frosts, and snowfall since 1852. The whole record was made by himself, and his thermometers have always hung on the same north porch. Mr. Davidson is now eighty-eight years of age—it is to be hoped that the records will be maintained by others for many years to come.

Mr. Waldron has forwarded to the Weather Bureau some newspaper clippings and data compiled from Mr. Davidson's record, and it is to be hoped that the complete manuscript will be deposited for safe keeping in the fire-proof vaults of the Weather Bureau.

In utilizing such records for the investigation of the question of the secular change of climate one should always remember that thermometers are always changing their zero points, and rain gages are greatly affected by such changes in their surroundings as increase or diminish their exposure to the wind. Even the records of frost will vary with the nature of the soil and the plant and the sheltering influence of the forests.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR OCTOBER.

In many respects the weather of the month was typical of summer conditions. The circulation of the air was generally feeble, temperatures were above the seasonal averages and the rainfall was abundant in the majority of districts. A number of areas of low pressure formed in the Plateau region or moved in from the north Pacific, only to dissipate in the upper Mississippi and Missouri valleys. It was eminently a month of inaction on the part of the lows. Two areas of high pressure of marked character moved across the country. The first appeared over the northern Plateau region on the morning of the 6th, moved to the middle Rocky Mountain region by the morning of the 7th and to the Mississippi Valley by

the morning of the 8th. The second appeared north of Montana on the morning of the 15th, moved to the upper Mississippi Valley by the morning of the 16th and to the New England coast during the next twenty-four hours. This extremely rapid movement was doubtless due in part to the sudden development of an area of low pressure over eastern New England on the 16th.

The distinguishing characteristics of the month were (1) the sluggishness of the lows; (2) the persistence of areas of high pressure over New England and the Middle Atlantic States; (3) the high temperatures east of the Rocky Mountains and the prevalence of summer weather types.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV, and the numerical values are given in Tables I and X.

As in the last three months, pressure has been above the average over the eastern seaboard. The so-called south Atlantic high for the current month appears over New England with maximum mean monthly values of 30.19 inches at Northfield, Vt., and Albany, N. Y. The persistence of areas of high pressure over New England and the Middle Atlantic States was one of the marked features of the pressure distribution during the month. This entire region was not traversed by a single well-defined area of low pressure during the month. As compared with the preceding month, pressure rose in all regions, save Florida, the upper Mississippi and the Missouri valleys, and the north Pacific coast, the greatest rise being over New England and the central Plateau region.

TEMPERATURE OF THE AIR.

Temperature was markedly above the average in all parts of the country, except the great Valley of California, the north Pacific coast, and the central Plateau region. The greatest positive departures were recorded in the upper Lake region, where the average daily excess of temperature above the normal was as much as 10° and 11° at several stations.

The area over which temperature was above normal extended westward across the Rocky Mountains to about the one hundred and twelfth meridian. During the months of August and September the Rocky Mountains formed the dividing line between regions of positive and negative departures.

The line of freezing temperature did not extend into the South Atlantic or Gulf States. Frosts occurred in the western and northern parts of North Carolina and in the mountainous districts of South Carolina on the 18th.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of the month was above average in all parts of the Dominion, except in the mainland of British Columbia, Alberta, and the extreme western portion of Assiniboia. In Ontario the departure from normal ranged between 8° and 12°, an amount which, judging by the Toronto record, has not been exceeded in sixty years. In Quebec and the Maritime Provinces the positive departure from normal was also large, ranging from about 7° in the eastern townships and portions of Nova Scotia to 3° or 4° in the Gaspe Peninsula, Prince Edward Island, and Cape Breton. In Manitoba also, the mean temperature was unusually high, averaging about 6° above normal; but farther west the difference became gradually less, and at Calgary a negative departure of 3° was registered. The monthly range of temperature was large, and particularly so in Ontario, in which province maxima of over 80° were recorded in nearly all localities about the 4th and 6th, and sharp frosts occurred very generally on and about the 16th and 18th. The absolutely highest temperature so far reported was 90°, at Lucknow, Ontario, on the 6th, and the lowest reported was 11°, at Calgary on the 3d.

The average temperature for the several geographic districts and the departures from normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	55.0	+ 4.7	+12.7	+ 1.3
Middle Atlantic	12	61.4	+ 5.6	+18.9	+ 1.9
South Atlantic	10	69.0	+ 5.0	+ 9.6	+ 1.0
Florida Peninsula	7	76.6	+ 3.6	+ 0.4	0.0
East Gulf	7	71.6	+ 4.8	+ 2.4	+ 0.2
West Gulf	7	71.0	+ 3.9	+10.7	+ 1.1
Ohio Valley and Tennessee	12	64.8	+ 8.1	+16.7	+ 1.7
Lower Lake	8	60.2	+ 8.9	+15.6	+ 1.6
Upper Lake	9	56.7	+ 9.8	+23.0	+ 2.3
North Dakota	8	48.9	+ 5.4	+40 2	+ 4.0
Upper Mississippi Valley	11	61.5	+ 8.8	+23.5	+ 2.4
Missouri Valley	10	59.4	+ 6.9	+30.0	+ 3.0
Northern Slope	7	49.4	+ 3.3	+33.1	+ 3.3
Middle Slope	6	60.0	+ 4.8	+22.4	+ 2.2
Southern Slope	6	63.8	+ 2.6	+ 9.5	+ 1.0
Southern Plateau	15	57.1	— 0.1	+ 4.3	+ 0.4
Middle Plateau	9	48.9	— 0.5	+13.6	+ 1.4
Northern Plateau	10	46.3	— 0.5	+21.5	+ 2.2
North Pacific	9	50.6	— 0.9	+11.3	+ 1.1
Middle Pacific	5	57.6	— 0.8	+ 7.0	+ 0.7
South Pacific	4	63.2	— 0.3	+ 7.0	+ 0.7

PRECIPITATION.

The month was one of more than the average rainfall, except in the Middle Atlantic States, the Lake region, northern Plateau and the southern Plateau.

The rainfall was especially heavy in the upper Mississippi Valley, in Florida and on the Gulf coast, in the mountain regions of the Carolinas, eastern Maine, and from northeastern Texas northward to South Dakota.

As has been remarked upon previous occasions, the persistence of areas of high prssure over the middle and south Atlantic coasts is usually attended by scant rains in the Lake region, Ohio Valley, and the Middle and South Atlantic States. The area of diminished rainfall for October, 1900, extended from North Carolina westward to the Mississippi, thence northward to eastern Iowa, northeastward to eastern Lake Superior, and thence southeastward to the coast of Massachusetts.

Traces of snow fell in northern New England and quite generally throughout the Rocky Mountain region from northern New Mexico to the British Possessions. The maximum amount recorded at any one station was 17 inches in southwestern Montana.

HAIL

The following are the dates on which hail fell in the respective States:

California, 3. Colorado, 26, 29. Georgia, 4. Idaho, 5, 17, 22, 28, 31. Illinois, 7, 31. Indiana, 15. Indian Territory, 21, 28, 30. Iowa, 28. Kansas, 21. Minnesota, 3, 4, 5, 6. Mississippi, 11, 21, 22. Missouri, 1, 7, 31. Nebraska, 1, 3, 15, 26, 27, 28, 29, 30. Nevada, 5, 19. New Mexico, 1, 17, 20, 27, 30. New York, 8, 16, 18, 19. Oklahoma, 20. Oregon, 2, 3, 5, 12, 18, 19, 23, 25, 28, 29, 31. Pennsylvania, 18, 30. Utah, 5, 29. Washington, 1, 5, 21, 22, 23, 25, 26. West Virginia, 10. Wisconsin, 3, 5, 15, 17.

SLEET.

The following are the dates on which sleet fell in the respective States:

California, 3, 4, 27, 28. Michigan, 16. Montana, 20, 22, 27, 30. Utah, 6, 23, 24, 29. Washington, 26, 28, 30. Wyoming, 23, 24, 28.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	3.94	100	0.0	— 2.5
Middle Atlantic	12	2.25	69	—1.0	— 7.4
South Atlantic	10	3.88	100	0.0	— 8.3
Florida Peninsula	7	6.26	124	+1.2	+ 2.9
East Gulf	7	4.95	174	+2.1	+ 9.8
West Gulf	7	3.84	135	+1.0	+ 3.8
Ohio Valley and Tennessee	12	2.65	100	0.0	— 7.6
Lower Lake	8	2.48	80	—0.6	— 2.0
Upper Lake	9	2.26	74	—0.8	— 2.3
North Dakota	8	1.85	148	+0.6	+ 2.2
Upper Mississippi Valley	11	4.30	163	+1.7	+ 1.8
Missouri Valley	10	3.05	174	+1.3	+ 3.1
Northern Slope	7	0.51	63	—0.3	— 1.1
Middle Slope	6	2.18	158	+0.8	+ 1.5
Southern Slope	6	3.02	150	+1.0	+ 8.9
Southern Plateau	15	0.64	76	—0.2	— 1.2
Middle Plateau	9	1.00	111	+0.1	— 3.1
Northern Plateau	10	2.41	184	+1.1	— 1.1
North Pacific	9	6.77	139	+1.9	+ 0.2
Middle Pacific	5	3.26	196	+1.6	— 3.0
South Pacific	4	0.70	100	0.0	— 4.3

In Canada.—Professor Stupart says:

A phenomenally heavy rainfall occurred in New Brunswick and western Nova Scotia, between the 9th and 12th, when 10.29 inches fell at Grand Manan, 9.49 at Yarmouth, and 8.33 at Fredericton. In eastern Nova Scotia the fall was not so excessive, and from the Bay of Fundy northward over New Brunswick the amount also lessened, and near the Quebec boundary the total fall of the month was only about average. In Quebec and Ontario there was a fairly general deficiency except very locally in some of the higher counties of the Ontario Peninsula and in the Rainy River district. Reports from stations in Alberta and Saskatchewan indicate a fairly pronounced excess of rain, but in Manitoba and Assiniboia a deficiency was general and decided. The few reports as yet received from British Columbia seem to indicate a rainfall differing very little from average. Light local snowfalls occurred in the Northwest Territories early in the month, and flurries were reported from some few stations in Ontario and the Maritime Provinces about the 17th.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.4	+0.9	Missouri Valley	4.1	+0.2
Middle Atlantic	5.7	+0.9	Northern Slope	4.3	+0.1
South Atlantic	5.2	+1.2	Middle Slope	4.1	+1.0
Florida Peninsula	5.7	+1.0	Southern Slope	4.0	+1.2
East Gulf	5.6	+2.0	Southern Plateau	2.6	+0.6
West Gulf	4.5	+0.9	Middle Plateau	4.4	+1.2
Ohio Valley and Tennessee	4.5	0.0	Northern Plateau	5.9	+0.8
Lower Lake	4.9	—0.9	North Pacific Coast	7.0	+1.1
Upper Lake	5.6	—0.5	Middle Pacific Coast	4.5	+1.3
North Dakota	4.6	—0.5	South Pacific Coast	3.5	+0.5
Upper Mississippi	4.5	+0.1			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	21	58	nw.	Mount Tamalpais, Cal.	22	54	nw.
Do	28	50	n.	Do	28	53	nw.
Buffalo, N. Y	17	54	w.	Do	29	50	nw.
Carson City, Nev	19	58	sw.	New York, N. Y	16	76	nw.
El Paso, Tex	20	53	w	Point Reyes Light, Cal.	23	60	nw.
Havre, Mont	21	54	sw	Portland, Oreg	19	53	s.
Mount Tamalpais, Cal	2	60	s.	Sioux City, Iowa	6	54	nw.
Do	11	50	w.	Winnemucca, Nev	19	56	sw.
Do	19	55	sw.				

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	85	+ 7	Missouri Valley	72	+ 7
Middle Atlantic	83	+ 9	Northern Slope	64	+ 6
South Atlantic	84	+ 7	Middle Slope	64	+ 6
Florida Peninsula	82	+ 2	Southern Slope	72	+10
East Gulf	83	+11	Southern Plateau	40	— 8
West Gulf	79	+ 8	Middle Plateau	47	+ 2
Ohio Valley and Tennessee	76	+ 6	Northern Plateau	66	+ 4
Lower Lake	76	+ 3	North Pacific Coast	82	— 3
Upper Lake	84	+ 7	Middle Pacific Coast	73	+ 2
North Dakota	83	+13	South Pacific Coast	69	0
Upper Mississippi	78	+ 8			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table VII, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 1,533 thunderstorm were received during the current month as against 2,203 in 1899 and 2,563 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 6th, 140; 30th, 129; 28th, 95; 5th, 91.

Reports were most numerous from: Iowa, 145; Minnesota, 125; Wisconsin, 110; Missouri, 106.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 4th to 12th.

In Canada.—Auroras were reported as follows: Father Point, 25th; Quebec, 24th, 25th; Minnedosa, 25th, 26th; Medicine Hat, 24th; Swift Current, 16th, 20th, 24th; Prince Albert, 24th, 26th.

Thunderstorms were reported as follows: Father Point, 4th; Quebec, 4th; Toronto, 7th, 26th; White River, 4th, 6th; Saugeen, 26th; Port Arthur, 6th; Battleford, 19th; Hamilton, Bermuda, 7th, 9th.

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J. HENRY, Professor of Meteorology.

Table I gives, for about 145 Weather Bureau stations making two observations daily and for about 25 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (....).

Table III gives, for 44 stations selected out of 144 that maintain continuous records, the mean hourly temperatures deduced from the Richard thermographs described and figured in the Report of the Chief of the Weather Bureau, 1891–92, p. 29.

Table IV gives, for 44 stations selected out of 142 that maintain continuous records, the mean hourly pressures as automatically registered by Richard barographs, except for Washington, D. C., where Foreman's barograph is in use. Both instruments are described in the Report of the Chief of the Weather Bureau, 1891–92, pp. 26 and 30.

Table V gives, for about 157 stations, the arithmetical means of the hourly movements of the wind ending with the respective hours, as registered automatically by the Robinson anemometer, in conjunction with an electrical recording mechanism, described and illustrated in the Report of the Chief of the Weather Bureau, 1891–92, p. 19.

Table VI gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table VII gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table VIII gives, for about 95 stations, the average hourly sunshine (in percentages) as derived from the automatic records made by two essentially different types of instruments, designated, respectively, the thermometric recorder and the photographic recorder. The kind of instrument used at each station is indicated in the table by the letter T or P in the column following the name of the station.

Table IX gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.06	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table X gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table XI gives the heights of rivers referred to zeros of gages.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are constructed in the same way. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest pressure at or near the center at that time.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level pressure, temperature, and resultant surface winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and are reduced to sea level and to standard gravity. The reduction for 30 inches of the mercurial barometer, as formerly shown by the marginal figures for each degree of latitude, has already been applied.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Surface temperatures; maximum, minimum, and mean. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—Total snowfall.

Chart IX.—West Indian monthly isobars, isotherms, and resultant winds.

Chart X.—Track of the Porto Rican hurricane from August 3 to September 7, 1899.

TABLE I.—*Climatological data for Weather Bureau Stations, October, 1900.*

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometer above ground.	Pressure, in inches: Mean actual, 8 a. m. + 8 p. m. ÷ 2.	Pressure, in inches: Mean reduced.	Pressure, in inches: Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. ÷ 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Wind: Maximum velocity: Miles per hour.	Wind: Maximum velocity: Direction.	Wind: Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							55.0	+ 4.7										85	3.94	0.0										6.4	
Eastport	76	69	74	30.06	30.15	+ .14	50.3	+ 3.5	72	22	56	24	20	44	25	47	45	88	8.26	+ 4.2	11	7,434	w.	42	n.	17	8	11	12	6.3	0.2
Portland, Me	103	81	89	30.05	30.15	+ .11	53.0	+ 3.9	76	24	60	28	20	46	31	48	46	82	5.81	+ 1.9	12	5,241	nw.	32	nw.	16	9	10	12	6.0	
Northfield	876	15	65	29.24	30.19	+ .15	51.3	+ 8.0	82	5	62	18	20	40	41	46	43	84	2.61	+ 0.3	10	6,069	s.	40	n.	17	7	13	11	6.1	
Boston	125	115	181	30.03	30.17	+ .12	56.6	+ 4.7	82	5	64	32	20	50	34	52	50	83	3.41	− 0.9	10	7,775	ne.	38	ne.	14	10	5	16	6.5	
Nantucket	12	43	54	30.15	30.16	+ .09	57.4	+ 4.8	75	8	62	40	17	53	22	55	52	86	2.57	− 1.4	14	9,465	ne.	38	n.	17	5	5	21	7.9	
Block Island	26	11	70	30.13	30.16	+ .06	57.4	+ 3.8	73	8	62	37	17	53	20	55	52	85	3.50	− 0.9	9	14,253	ne.	48	ne.	9	8	9	14	6.2	
Narragansett	....	10	....	....	....	....	56.6	+ 4.3	74	*	63	28	20	50	31	....	....	....	3.34	− 1.4	6	....	e.	....	....	....	11	6	14	....	
New Haven	106	117	140	30.06	30.18	+ .11	57.3	+ 4.9	79	5	65	29	20	49	34	53	51	86	2.03	− 2.0	8	6,724	n.	44	nw.	16	11	6	14	6.0	
Mid. Atlan. States.							61.4	+ 5.6										83	2.25	− 1.0										5.7	
Albany	97	84	113	30.08	30.19	+ .13	57.6	+ 7.0	90	6	67	30	20	49	35	52	49	82	1.83	− 1.4	8	5,042	s.	27	w.	16	11	8	12	5.9	
Binghamton	875	79	90	....	....	....	55.8	+ 7.7	87	6	65	24	20	46	37	....	....	....	2.05	− 0.8	9	3,821	nw.	30	nw.	16	5	8	18	6.8	
New York	314	108	346	29.84	30.18	+ .10	60.8	+ 5.8	77	6	67	37	17	55	29	55	52	79	4.17	+ 0.7	10	9,348	ne.	76	nw.	16	11	3	17	6.2	
Harrisburg	374	94	104	....	....	....	60.6	+ 8.1	88	6	68	32	20	53	31	....	....	....	1.25	− 1.8	9	4,551	e.	27	w.	18	12	6	13	5.6	
Philadelphia	117	168	184	30.06	30.18	+ .08	61.6	+ 5.8	86	6	68	38	17	55	33	56	53	78	3.00	+ 0.1	10	6,691	ne.	36	nw.	16	10	5	16	5.9	
Scranton	805	111	119	....	....	....	58.2	....	90	6	67	35	20	49	38	....	....	....	2.66	....	11	4,740	ne.	35	nw.	16	9	9	13	6.1	
Atlantic City	52	68	76	30.13	30.18	+ .11	60.2	+ 3.9	77	6	66	37	17	55	30	57	55	85	1.86	− 1.4	9	7,923	e.	36	n.	16	9	10	12	5.9	
Cape May	17	47	51	30.17	30.19	+ .11	61.4	+ 2.5	78	6	66	37	20	57	25	58	....	....	1.96	− 1.4	8	5,865	n.	32	nw.	16	10	10	11	5.4	
Baltimore	123	68	82	30.04	30.17	+ .08	62.0	+ 5.1	85	6	70	36	20	54	31	58	56	84	1.68	− 1.3	10	3,585	e.	21	ne.	13	9	8	14	6.1	
Washington	112	59	76	30.06	30.18	+ .08	61.6	+ 5.4	87	6	71	35	20	53	34	57	54	85	1.44	− 1.6	8	4,196	ne.	24	nw.	16	13	4	14	5.4	
Cape Henry	....	5	34	....	....	....	66.5	+ 4.7	89	6	72	41	18	60	31	....	....	....	2.00	− 1.8	11	9,969	ne.	46	n.	16	11	8	12	5.6	
Lynchburg	681	83	88	29.45	30.17	+ .08	63.3	+ 6.2	87	6	72	36	18	54	40	57	55	85	3.49	+ 0.2	8	2,134	ne.	16	se.	23	13	7	11	4.7	
Norfolk	91	102	111	30.07	30.17	+ .08	65.8	+ 5.2	88	6	72	43	18	60	27	61	59	84	2.22	− 1.6	7	6,365	ne.	28	nw.	8	10	10	11	5.6	
Richmond	144	82	90	....	....	....	64.6	....	88	6	73	38	18	56	34	....	....	....	2.55	....	9	3,159	n.	16	n.	16	13	6	12	5.1	
S. Atlantic States.							69.0	+ 5.0										84	3.88	0.0										5.2	
Charlotte	773	68	76	29.33	30.14	+ .06	65.2	+ 4.9	86	6	73	42	18	57	30	59	56	79	3.41	− 0.3	10	4,487	ne.	23	s.	23	11	9	11	5.3	
Hatteras	11	17	36	30.13	30.14	+ .08	69.4	+ 4.9	84	4	73	53	18	66	14	65	63	83	3.32	− 2.8	8	9,331	ne.	38	n.	17	14	9	8	4.7	
Kittyhawk	8	12	30	....	....	....	68.2	+ 4.6	88	6	74	46	18	63	18	....	....	....	1.69	− 2.0	5	....	ne.	....	....	....	17	6	8	4.3	
Raleigh	376	93	101	29.77	30.16	+ .08	65.6	+ 7.6	88	6	75	38	18	57	35	59	56	79	1.04	− 2.3	9	4,053	ne.	22	w.	17	14	9	8	4.5	
Wilmington	78	82	90	30.05	30.13	+ .06	68.0	+ 4.5	85	5	76	46	18	60	28	62	61	86	4.20	+ 0.4	9	5,620	ne.	22	e.	3	11	14	6	4.5	
Charleston	48	14	92	30.07	30.12	+ .05	70.5	+ 3.8	82	1	76	55	18	65	19	65	64	84	4.63	+ 0.4	10	8,850	ne.	37	e.	12	10	13	8	5.0	
Columbia	....	5	....	....	....	....	68.3	+ 4.2	87	6	78	39	18	59	35	....	....	....	4.88	+ 2.5	11	....	ne.	....	....	....	10	8	13	5.8	
Augusta	180	89	103	29.92	30.10	+ .04	69.2	+ 5.5	85	6	77	44	18	61	30	63	61	84	2.63	+ 0.2	10	4,141	ne.	19	ne.	17	9	8	14	5.9	
Savannah	65	79	89	30.02	30.08	.00	71.5	+ 5.1	86	1	78	52	18	64	24	66	65	89	5.87	+ 2.2	11	5,270	ne.	24	e.	11	12	6	13	5.3	
Jacksonville	43	69	84	29.99	30.04	+ .01	74.4	+ 4.7	86	7	81	59	14	68	23	69	67	85	7.14	+ 2.0	18	5,399	ne.	24	se.	21	6	12	13	6.7	
Florida Peninsula.							76.4	+ 2.8										82	7.03	+ 1.4										5.7	
Jupiter	28	13	30	29.93	29.96	+ .01	78.5	+ 3.1	87	9	84	68	29	74	14	74	72	83	10.13	+ 0.9	20	8,965	ne.	32	n.	27	2	16	13	6.6	
Key West	22	43	50	29.93	29.95	+ .01	79.6	+ 1.1	87	15	84	71	26	76	15	80	73	80	5.85	+ 0.6	16	6,517	ne.	26	ne.	25	8	18	5	5.0	
Tampa	34	60	67	29.95	29.99	− .02	77.2	+ 4.1	88	21	85	64	14	69	20	70	68	83	5.11	+ 2.7	7	4,725	ne.	24	s.	4	10	16	5	5.5	
East Gulf States.							71.6	+ 4.8										83	4.95	+ 2.1										5.6	
Atlanta	1,174	139	156	28.88	30.11	.00	67.0	+ 4.8	83	7	74	49	12	60	24	61	59	83	2.79	+ 0.5	10	7,192	e.	30	se.	5	8	9	14	6.4	
Macon	370	93	99	....	....	....	69.0	....	87	1	77	50	19	61	28	....	....	....	1.27	....	10	4,528	ne.	23	ne.	3	7	16	8	5.2	
Pensacola	56	78	90	....	....	....	73.9	+ 4.7	92	1	80	59	9	67	20	....	....	....	10.90	+ 7.6	10	7,022	ne.	48	sw.	22	12	8	11	5.4	
Mobile	57	88	96	29.97	30.03	− .01	72.2	+ 4.8	90	1	80	54	9	65	21	67	65	85	4.63	+ 1.2	12	5,098	n.	30	w.	7	8	10	13	5.8	
Montgomery	223	100	112	29.82	30.05	− .02	71.2	+ 6.0	90	1	79	54	12	63	25	64	62	82	5.29	+ 2.9	8	4,707	e.	24	s.	21	10	9	12	5.5	
Meridian	375	84	93	....	....	....	68.0	+ 5.8	88	1	77	47	9	59	30	....	....	....	5.24	+ 3.8	11	3,549	ne.	22	n.	7	7	13	11	5.9	
Vicksburg	247	65	73	29.76	30.02	− .06	69.6	+ 4.3	92	1	78	46	9	62	24	63	61	83	4.41	+ 1.8	8	3,533	ne.	30	nw.	31	11	7	13	5.5	
New Orleans	51	112	130	29.96	30.02	.00	73.9	+ 4.1	90	2	80	59	9	68	19	67	66	82	3.55	+ 0.4	8	5,236	ne.	31	s.	21	8	17	6	5.0	
Port Eads	....	27	....	....	....	....	76.8	+ 3.6	91	*	83	62	12	71	18	71	....	....	2.76	− 1.1	12	....	ne.	36	ne.	8	3	16	12	....	
West Gulf States.							71.0	+ 3.9										79	3.84	+ 1.0										4.5	
Shreveport	249	77	84	29.77	30.03	− .03	70.0	+ 4.7	92	1	80	48	9	60	29	62	60	80	4.66	+ 1.6	7	4,093	n.	26	se.	21	12	7	12	5.4	
Fort Smith	457	74	82	29.51	30.02	− .03	66.8	+ 5.7	89	2	77	45	9	56	34	60	57	82	6.19	+ 3.4	10	5,007	e.	34	w.	31	14	7	10	4.9	
Little Rock	357	93	100	29.67	30.05	− .02	66.6	+ 4.3	86	4	76	47	9	57	30	61	59	84	2.49	0.0	8	3,942	ne.	34	nw.	7	9	13	9	5.3	
Corpus Christi	18	42	50	29.96	29.98	− .05	75.0	+ 2.5	90	6	80	54	*	70	26	70	68	81	2.01	− 0.2	11	7,813	se.	38	n.	18	17	6	8	3.7	
Fort Worth	670	106	114	....	....	....	69.8	....	94	6	80	45	12	60	35	....	....	....	3.22	....	7	6,853	s.	42	s.	31	17	10	4	3.8	
Galveston	54	84	88	29.92	29.97	− .06	76.4	+ 4.1	91	7	82	60	11	71	20	69	66	76	5.54	+ 1.3	8	5,462	se.	27	nw.	21	16	9	6	3.8	
Palestine	510	54	61	29.49	30.03	− .02	69.8	+ 3.3	90	6	80	48	12	60	31	62	59	78	3.02	− 0.2	5	4,496	s.	26	s	30	14	5	12	5.1	
San Antonio	701	95	104	29.26	30.00	− .03	72.6	+ 2.9	95	4	84	46	10	62	39	63	58	74	2.94	+ 1.3	10	4,013	se.	26	nw.	21	15	10	6	3.9	
Ohio Val. & Tenn.							64.8	+ 8.1										76	2.65	0.0										4.5	
Chattanooga	762	106	112	29.32	30.12	+ .02	66.7	+ 6.2	87	1	76	49	12	58	27	60	58	81	5.50	+ 2.8	12	4,144	ne.	29	se.	5	10	14	7	5.1	
Knoxville	1,004	10	88	29.08	30.14	+ .02	65.6	+ 8.0	89	6	76	45	10	55	28	58	56	82	2.21	− 0.6	8	4,009	ne.	26	s.	22	14	11	6	4.5	
Memphis	397	140	154	29.66	30.08	− .04	67.4	+ 5.8	87	2	75	46	9	60	24	61	59	82	3.43	+ 0.6	9	5,937	ne.	34	se.	21	13	5	13	5.2	
Nashville	546	128	134	29.53	30.11	+ .03	66.4	+ 6.8	88	2	76	44	19	57	29	59	56	77	3.93	+ 1.4	7	4,340	se.	33	se.	21	9	12	10	5.4	
Lexington	989	75	102	....	....	....	64.9	+ 9.6	87	5	75	38	17	55	31	....	....	....	0.79	− 1.4	6	6,035	se.	32	s	22	15	11	5	3.8	
Louisville	525	114	136	29.55	30.12	+ .03	66.0	+ 8.3	90	2	77	39	18	55	35	57	54	74	2.22	− 0.6	6	4,703	n.	29	se.	22	17	7	7	3.6	
Evansville	434	72	82	....	....	....	66.2	....	91	3	76	42	17	56	30	....	....	....	3.46	....	7	4,063	ne.	27	sw.	31	18	6	7	3.5	
Indianapolis	822	154	164	29.23	30.10	+ .02	63.4	+ 9.0	87	3	73	37	17	54	26	55	49	67	3.20	+ 0.4	4	6,119	s.	35	s	31	15	9	7	4.3	
Cincinnati	628	152	157	29.46	30.13	+ .05	64.2	+ 7.8	87	5	75	37	17	54	32	56	52	71	1.45	− 1.0	5	3,774	se.	28	sw.	23	17	8	6	3.9	
Columbus	824	87	100	29.27	30.14	+ .07	62.2	+ 8.5	87	5	73	35	18	52	33	54	51	75	2.86	+ 0.2	5	4,467	se.	23	sw.	23	14	10	7	4.3	
Pittsburg	842	116	123	29.26	30.15	+ .07	62.9	+ 8.2	89	6	74	36	20	52	32	54	50	70	2.24	− 0.2	6	3,600	n.	24	se.	31	14	14	3	4.2	
Parkersburg	638	77	84	29.49	30.18	+ .09	63.0	+10.7	87	5	75	29	18	51	38	54	51	77	1.30	− 1.8	5	2,983	se.	26	w.	7	13	12	6	4.7	
Elkins	1,940	41	50	....	....	....	56.8	....	87	6	70	26	18	43	45	....	....	....	2.46	....	7	2,153	n.	20	sw.	22	10	14	7	5.4	
Lower Lake Region.							60.2	+ 8.9										76	2.48	− 0.6										4.9	
Buffalo	767	178	206	29.32	30.14	+ .10	60.5	+10.2	85	6	68	34	20	53	28	54	50	72	3.39	− 0.3	7	8,275	sw.	51	w.	17	5	16	10	6.2	
Oswego	335	76	87	29.79	30.16	+ .10	57.4	+ 7.4	81	5	65	30	20	50	26	52	49	78	3.26	0.0	9	7,149	se.	40	n.	16	12	9	10	5.0	
Rochester	523	81	90	29.50	30.15	+ .10	59.4	+ 9.8	87	6	68	32	20	51	30	53	50	77	3.16	+ 0.2	8	4,806	sw.	24	nw.	16	13	12	6	4.9	
Erie	713	92	102	29.38	30.14	+ .09	60.8	+ 8.6	87	6	68	38	20	53	28	55	51	77	2.06	− 2.0	10	7,111	s.	35	s	31	16	9	6	4.5	
Cleveland	762	190	201	29.33	30.14	+ .07	61.2	+ 9.0	85	6	69	37	20	53	30	54	51	74	1.66	− 1.2	5	9,328	se.	46	nw.	16	15	9	7	4.5	
Sandusky	629	62	70	29.46	30.13	+ .06	61.8	+ 8.6	88	5	70	41	20	53	27	55	52	76	1.20	− 1.6	4	4,671	s.	29	nw.	16	11	13	7	5.3	
Toledo	628	123	128	29.46	30.13	+ .08	60.7	+ 8.6	86	5	70	34	17	52	28	54	50	76	2.29	− 0.2	7	5,773	se.	36	se.	22	19	6	6	4.0	
Detroit	730	160	166	29.34	30.12	+ .07	60.0	+ 9.0	84	5	68	40	17	52	23	54	51	78	2.85	+ 0.3	6	5,841	sw.	26	s.	7	12	13	6	4.9	
Upper Lake Region.							56.7	+ 9.3										84	2.28	− 0.8										5.6	
Alpena	609	61	65	29.46	30.12	+ .09	55.0	+ 9.8	81	4	63	29	17	47	33	51	49	87	1.62	− 2.2	11	6,719	se.	34	nw.	16	11	8	12	5.5	
Escanaba	612	43	57	29.39	30.05	+ .04	54.7	+10.0	68	5	61	32	17	48	29	52	49	85	3.51	+ 0.2	12	6,941	s.	30	s.	31	8	11	12	5.5	
Grand Haven	632	55	64	29.41	30.08	+ .06	57.4	+ 7.8	81	6	66	28	17	48	29	52	50	86	2.35	− 0.9	10	5,600	se.	30	sw.	31	11	12	8	5.1	
Houghton	668	66	74	....	....	....	55.9	....	80	6	65	34	17	47	35	....	....	....	1.61	....	13	5,278	se.	38	nw.	7	10	11	10	5.8	
Marquette	734	67	95	29.24	30.03	+ .03	56.4	+11.3	80	6	64	36	16	49	32	51	49	85	1.32	− 1.9	14	8,495	s.	38	s.	6	6	14	11	6.1	
Port Huron	638	70	108	29.46	30.15	+ .11	58.4	+ 9.5	85	5	67	33	17	49	30	53	50	81	1.14	− 1.6	7	6,846	s.	39	nw.	16	11	13	7	5.0	
Sault Ste. Marie	614	40	61	29.41	30.07	+ .06	54.4	+11.7	80	6	62	32	17	47	28	50	48	86	1.68	− 1.8	12	5,559	se.	35	nw.	7	8	9	14	6.3	
Chicago	823	241	274	29.21	30.09	+ .05	61.4	+ 9.4	86	5	68	41	17	55	29	56	54	84	1.35	− 1.6	5	11,344	s.	48	ne.	16	18	4	9	4.3	
Milwaukee	681	124	142	29.35	30.08	+ .05	58.6	+ 9.4	84	5	66	39	17	52	23	53	50	79	2.22	− 0.1	11	7,276	w.	38	sw.	31	12	2	17	5.8	
Green Bay	617	49	57	29.40	30.07	+ .03	57.5	+10.6	81	6	66	34	17	50	26	52	49	83	4.29	+ 1.8	14	5,604	s.	40	n.	16	8	10	13	6.2	
Duluth	702	95	115	29.21	29.97	− .03	53.5	+ 8.6	74	6	60	34	16	48	27	49	47	83	3.07	+ 0.5	15	7,701	ne.	38	sw.	6	8	9	14	6.1	
North Dakota.							49.4	+ 6.1										83	1.74	+ 0.4										4.6	
Moorhead	935	54	60	28.93	29.95	− .05	51.7	+ 8.6	82	19	62	27	16	42	36	47	44	85	2.76	+ 0.8	10	7,056	se.	40	se.	20	10	7	14	6.0	
Bismarck	1,674	16	29	28.18	29.98	− .02	49.5	+ 5.7	78	14	62	27	16	37	42	43	39	77	1.43	+ 0.4	6	6,000	nw.	30	nw.	6	20	3	8	3.7	
Williston	1,875	15	31	27.96	29.96	− .05	47.1	+ 3.9	79	18	60	22	25	35	42	42	40	86	1.03	0.0	8	5,130	n.	30	n.	6	20	4	7	4.2	

TABLE I.—*Climatological data for Weather Bureau Stations, October, 1900*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches: Mean actual, 8 a. m. + 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Departure from normal.	Days with .01, or more.	Wind: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Upper Mis. Valley.							61.5	+ 8.8										78	4.30	+ 1.7										4.5	
Minneapolis	....	99	208	......	......	......	57.8	+ 9.9	79	4	67	34	8	48	32	....	....	....	4.52	+ 2.7	11	8,356	s.	40	s.	6	10	11	10	....	
St. Paul	837	114	124	29.07	29.97	— .04	57.8	+10.7	78	3	66	35	8	50	30	51	48	76	7.55	+ 5.7	11	6,011	se.	29	w.	6	11	11	9	5.3	
La Crosse	714	70	78	......	......	......	59.1	+ 9.6	86	3	67	38	17	51	27	....	....	....	12.09	+ 9.8	10	5,157	se.	28	nw.	15	14	7	10	5.0	
Davenport	606	71	79	29.39	30.04	— .02	61.8	+ 9.7	86	3	71	35	17	52	30	55	52	78	2.00	— 0.6	8	4,454	se.	25	se.	31	19	3	9	3.7	
Des Moines	861	84	88	29.10	30.02	— .03	60.4	+ 8.2	87	4	71	33	8	50	37	55	53	83	3.08	0.0	7	5,655	sw.	32	sw.	30	10	12	9	5.2	
Dubuque	698	101	109	29.30	30.05	+ .01	60.2	+ 9.6	86	3	70	35	17	51	32	53	50	77	2.38	— 0.3	9	4,776	se.	25	nw.	7	14	8	9	4.5	
Keokuk	614	63	78	29.39	30.04	— .02	62.4	+ 8.3	87	4	72	36	8	53	30	56	53	81	5.36	+ 2.6	10	4,404	se.	28	s.	31	18	6	7	3.7	
Cairo	356	87	93	29.70	30.09	+ .02	65.6	+ 6.9	87	3	74	44	18	57	28	59	57	84	1.70	— 1.0	8	4,787	se.	29	s.	31	8	14	9	5.5	
Springfield, Ill.	644	82	92	29.39	30.07	.00	62.9	+ 7.9	86	4	73	37	17	53	30	55	52	76	2.63	— 0.1	7	5,642	s.	33	s.	31	15	12	4	3.8	
Hannibal	534	75	110	......	......	......	62.2	+ 7.2	87	2	73	35	18	52	37	....	....	....	3.88	+ 1.2	8	5,482	sw.	30	s.	31	15	8	8	4.3	
St. Louis	567	111	210	29.46	30.07	+ .01	65.8	+ 8.3	88	4	75	41	17	57	25	57	53	72	2.07	— 0.8	6	5,417	s.	38	sw.	31	16	9	6	3.8	
Missouri Valley.							59.4	+ 6.9										72	3.05	+ 1.3										4.1	
Columbia	784	4	84	......	......	......	62.1	+ 6.0	89	5	74	33	18	50	41	....	....	....	7.73	+ 6.3	7	4,718	se.	30	nw.	6	14	9	8	4.5	
Kansas City	963	78	95	29.01	30.02	— .03	63.6	+ 7.9	88	2	73	40	17	54	28	56	52	76	4.19	+ 1.4	7	5,740	se.	30	nw.	31	16	6	9	3.8	
Springfield, Mo	1,324	100	103	28.64	30.03	— .03	62.6	+ 6.6	84	2	71	40	8	54	30	56	53	79	4.63	+ 1.8	7	6,673	se.	36	nw.	6	16	10	5	3.8	
Topeka	......	81	......	......	......	......	62.8	+ 6.8	88	2	73	36	17	52	35	....	....	....	2.97	+ 1.1	7	......	......	....	......	....	17	5	9	4.0	
Lincoln	1,189	75	84	28.69	29.95	— .10	61.5	+ 7.4	89	4	72	34	17	50	36	53	48	72	2.45	+ 0.6	9	8,231	se.	35	s.	6	15	10	5	4.1	
Omaha	1,105	115	121	28.79	29.95	— .09	61.6	+ 8.7	89	4	71	37	17	52	32	55	52	77	5.43	+ 3.0	9	5,836	se.	32	n.	31	15	9	7	4.4	
Valentine	2,598	39	40	27.25	29.97	— .07	53.6	+ 4.4	87	4	69	24	16	38	46	43	35	61	0.38	— 0.5	4	6,914	nw.	36	nw.	21	15	8	8	4.5	
Sioux City	1,135	96	164	......	......	......	58.8	+ 7.8	86	5	70	33	8	48	39	....	....	....	2.21	+ 0.5	8	9,604	se.	54	nw.	6	16	8	7	3.8	
Pierre	1,572	11	19	28.27	29.94	— .09	54.6	+ 5.2	85	19	67	26	16	42	43	45	38	64	0.50	— 0.2	2	6,681	nw.	42	nw.	20	16	9	6	3.8	
Huron	1,306	56	67	28.53	29.94	— .09	53.8	+ 7.3	83	5	67	25	16	40	48	46	43	78	1.47	+ 0.2	7	8,064	se.	42	se.	20	14	8	9	4.8	
Yankton	1,233	52	58	......	......	......	58.0	+ 8.3	88	4	70	34	31	46	42	....	....	....	1.59	+ 0.2	6	6,638	s.	36	s.	19	19	5	7	3.6	
Northern Slope.							49.4	+ 3.3										64	0.51	— 0.3										4.3	
Havre	2,505	46	47	27.26	29.91	— .11	46.8	+ 2.8	80	18	59	23	24	35	42	40	34	68	0.85	+ 0.2	5	7,588	sw.	54	sw.	21	16	9	6	4.4	3.0
Miles City	2,371	42	50	27.41	29.92	— .12	50.6	+ 4.5	78	*	63	26	31	38	42	44	40	78	0.10	— 0.8	2	4,125	nw.	34	nw.	22	15	11	5	4.0	
Helena	4,110	88	93	25.76	29.99	— .07	45.8	+ 0.6	69	12	55	28	25	36	32	38	30	60	1.21	+ 0.4	7	5,098	sw.	40	sw.	18	9	11	11	5.5	8.7
Kalispell	2,965	45	51	26.87	30.00	— .05	43.6	......	68	18	53	22	27	34	32	39	35	77	0.76	......	10	4,031	nw.	36	sw.	18	6	7	18	6.9	T.
Rapid City	3,234	46	50	26.58	29.92	— .11	53.1	+ 4.1	81	12	66	26	31	40	42	43	33	56	0.26	— 0.4	4	5,961	nw.	32	s.	28	19	9	3	2.9	
Cheyenne	6,088	56	64	24.01	30.02	— .03	48.0	+ 8.1	74	4	62	16	31	34	40	37	23	44	0.03	— 0.7	2	7,810	nw.	42	w.	31	19	8	4	3.1	T.
Lander	5,372	28	36	24.63	30.03	— .04	46.0	+ 1.9	73	3	61	12	31	31	41	37	30	63	0.73	— 0.2	5	2,991	sw.	34	sw.	1	18	6	7	3.9	4.8
North Platte	2,821	43	52	27.05	29.99	— .05	55.8	+ 6.0	90	4	72	26	8	40	50	45	38	62	0.39	— 0.6	4	6,130	w.	38	nw.	21	17	11	3	3.5	
Middle Slope.							60.0	+ 4.8										64	2.18	+ 0.8										4.1	
Denver	5,291	79	151	24.73	30.01	— .03	54.0	+ 3.5	82	4	69	19	31	39	40	40	22	36	0.33	— 0.6	2	5,771	s.	40	nw.	6	19	8	4	3.0	2.0
Pueblo	4,685	80	86	25.29	29.98	— .03	55.0	+ 2.8	83	3	71	22	31	39	47	41	26	42	0.22	— 0.5	4	4,254	nw.	29	w.	5	16	11	4	3.7	
Concordia	1,398	42	47	28.50	29.98	— .06	61.6	+ 7.1	89	4	73	32	17	51	40	54	50	79	3.27	+ 1.7	10	6,210	s.	33	s.	20	16	9	6	4.0	
Dodge	2,509	44	52	27.38	29.97	— .04	61.6	+ 6.5	92	5	74	35	17	49	44	51	47	72	0.92	— 0.3	3	8,690	s.	48	sw.	6	19	9	3	3.5	
Wichita	1,358	78	85	28.58	30.00	— .04	63.3	+ 5.7	89	4	73	39	11	54	32	56	53	77	5.71	+ 3.9	7	6,063	s.	29	n.	6	12	8	11	5.1	
Oklahoma	1,214	54	62	28.72	30.01	— .02	64.8	+ 3.3	89	6	74	41	8	56	34	57	54	76	2.61	+ 0.9	8	6,972	s.	40	w.	20	12	5	14	5.2	
Southern Slope.							63.4	+ 3.1										72	2.98	+ 1.1										4.0	
Abilene	1,738	45	54	28.19	30.00	— .05	67.5	+ 3.0	91	6	77	42	11	58	34	58	54	71	4.39	+ 2.0	5	5,969	se.	33	nw.	21	12	11	8	4.7	
Amarillo	3,676	54	61	26.26	30.00	— .03	59.4	+ 3.2	85	3	70	35	31	48	37	51	47	72	1.58	+ 0.2	8	11,671	s.	58	nw.	21	17	7	7	3.4	
Southern Plateau.							60.5	+ 0.2										40	0.70	— 0.1										2.6	
El Paso	3,762	10	110	26.18	29.96	— .01	65.3	+ 2.3	91	5	79	35	31	52	40	50	37	45	1.23	+ 0.3	4	7,154	nw.	53	w.	20	17	12	2	2.8	
Santa Fe	7,013	47	50	23.30	30.03	+ .02	51.0	+ 1.2	70	2	61	21	31	41	33	40	28	49	1.19	+ 0.2	7	4,253	se.	27	sw.	5	21	6	4	3.1	
Flagstaff	6,907	12	25	23.35	30.10	......	46.6	— 2.2	69	6	62	11	30	32	47	40	....	....	1.54	+ 0.4	6	......	sw.	....	......	....	18	8	5	....	
Phoenix	1,108	47	57	28.74	29.90	+ .01	71.3	+ 1.5	94	8	85	36	31	57	38	53	37	36	0.22	— 0.4	3	2,850	e.	20	nw.	20	20	6	5	2.8	
Yuma †	141	16	50	29.71	29.85	— .03	71.4	— 1.6	96	18	86	48	31	57	40	57	45	43	T.	— 0.6	0	2,988	ne.	35	w.	20	14	6	1	2.1	
Independence	3,910	51	58	25.95	29.88	— .06	58.8	+ 0.1	80	8	72	29	30	46	31	44	22	27	0.01	— 0.3	1	5,973	nw.	48	w.	28	22	9	0	2.4	
Middle Plateau.							50.9	+ 0.1										47	0.90	— 0.0										4.4	
Carson City	4,720	82	92	25.25	30.01	+ .01	49.4	— 0.8	77	16	62	17	30	37	42	41	30	53	0.73	+ 0.3	6	5,788	sw.	58	sw.	19	12	11	8	4.6	T.
Winnemucca	4,344	59	70	25.66	30.04	— .01	46.7	— 1.5	76	17	61	18	30	33	46	39	26	51	0.74	+ 0.3	7	6,887	sw.	56	sw.	19	13	5	13	5.3	T.
Cedar City	5,850	36	47	24.26	30.02	+ .04	52.3	......	70	10	62	20	30	42	33	41	27	43	0.39	......	7	5,132	se.	26	sw.	4	18	9	4	3.6	T.
Salt Lake City	4,366	105	110	25.62	30.03	— .04	52.6	+ 0.3	76	11	62	27	30	43	32	42	31	48	1.99	+ 0.4	7	4,837	se.	42	nw.	19	17	4	10	4.4	6.3
Grand Junction	4,608	43	50	25.39	30.02	— .01	54.8	+ 2.3	80	4	68	26	31	41	36	42	27	42	0.14	— 0.9	5	3,986	nw.	29	sw.	5	13	12	6	3.9	T.
Northern Plateau.							49.7	— 0.3										66	2.12	+ 0.8										5.9	
Baker City	3,471	53	58	26.42	30.03	— .05	45.7	— 2.4	73	13	56	26	27	35	33	38	30	62	1.98	+ 0.9	15	3,938	s.	29	sw.	19	8	5	18	6.0	0.1
Boise	2,739	61	68	27.17	30.02	— .09	50.6	+ 1.2	82	17	62	29	30	40	38	43	35	59	2.20	+ 1.2	11	3,044	se.	20	sw.	3	10	10	11	5.3	T.
Lewiston	770	52	61	......	......	......	52.7	— 0.1	74	16	62	33	27	43	32	....	....	....	1.91	+ 0.2	13	2,367	e.	30	nw.	22	7	18	6	5.0	
Pocatello	4,482	48	56	25.49	30.04	— .04	48.2	+ 0.2	74	16	60	25	25	36	41	40	30	55	1.01	0.0	8	8,745	s.	42	w.	5	10	5	16	5.9	T.
Spokane	1,943	99	107	27.92	29.98	— .08	48.2	+ 0.2	69	16	57	28	27	40	30	43	38	74	2.55	+ 1.0	16	4,889	s.	30	sw.	21	0	9	22	8.3	
Walla Walla	1,000	65	73	28.90	29.97	— .11	53.0	— 1.0	75	13	62	28	27	44	29	49	47	82	3.09	+ 1.6	16	4.555	s.	34	s.	18	8	17	6	5.1	
N. Pac. Coast Reg.							50.6	— 0.9										82	6.77	+ 1.9										7.0	
Neah Bay	50	7	24	29.82	29.88	— .16	48.6	— 1.8	59	21	53	37	24	44	16	48	46	90	14.36	+ 4.0	20	4,711	e.	36	ne.	28	4	8	19	7.2	
Port Crescent	259	15	20	......	......	......	47.5	— 0.1	64	8	55	30	6	40	26	....	....	....	5.13	+ 1.5	20	2,554	e.	24	w.	21	5	11	15	6.5	
Seattle	123	114	121	29.80	29.93	— .13	51.8	+ 0.2	68	9	58	41	1	46	24	48	45	82	4.16	+ 0.7	19	4,898	se.	30	se.	28	3	8	20	7.3	
Tacoma	213	113	120	......	......	......	50.0	— 0.6	68	9	56	35	2	44	25	....	....	....	6.13	+ 2.1	22	4,714	sw.	32	s.	28	5	4	22	7.5	
Astoria	20	57	64	......	......	......	52.2	— 2.0	70	8	57	40	24	47	20	....	....	....	8.50	+ 2.4	22	......	sw.	....	......	....	4	8	19	7.8	
Portland, Oreg	154	203	213	29.80	29.96	— .12	52.2	— 1.2	74	8	59	37	26	45	28	49	45	79	3.87	+ 0.2	17	7,072	nw.	53	s.	19	5	8	18	6.9	
Roseburg	518	56	67	29.41	29.98	— .12	51.8	— 0.9	73	8	60	33	24	43	34	48	44	78	5.25	+ 2.5	19	2,551	e.	19	w.	22	7	9	15	6.3	
Mid. Pac. C'st Reg.							57.6	— 0.8										73	3.26	+ 1.6										4.5	
Eureka	62	60	69	29.95	30.01	— .04	53.8	+ 0.6	67	21	59	39	29	48	19	52	50	90	7.07	+ 4.6	14	4,467	nw.	33	ne.	22	6	12	13	5.7	
Mount Tamalpais	2,375	11	18	27.54	30.01	......	55.2	......	79	9	60	35	29	50	26	48	41	65	3.44	......	9	13,472	nw	60	s.	2	19	4	8	3.6	
Red Bluff	332	50	56	29.61	29.96	— .04	60.0	— 3.5	87	9	70	40	29	50	31	52	46	66	3.25	+ 1.9	9	4,881	n.	35	se.	19	18	4	9	3.8	
Sacramento	69	106	117	29.89	29.97	— .02	60.8	— 1.0	85	10	72	39	30	50	34	53	46	63	1.74	+ 0.8	6	5,7[illegible]9	se.	36	sw.	1	15	9	7	4.4	
San Francisco	155	161	167	29.85	30.01	+ .01	58.8	— 0.5	83	9	65	48	30	52	28	54	51	80	1.48	+ 0.3	9	6,752	w.	31	sw.	19	15	10	6	3.9	
Point Reyes Light	......	12	16	......	......	......	54.7	+ 0.6	80	9	60	46	29	49	32	....	....	....	2.77	+ 0.4	6	12,691	nw.	60	nw.	23	10	13	8	5.4	
S. Pac. Coast Reg.							63.2	— 0.3										69	0.70	0.0										3.5	
Fresno	330	67	70	29.61	29.96	.00	62.6	— 2.3	91	10	75	36	30	50	37	53	44	57	0.33	— 0.2	5	2,970	nw.	18	nw.	28	20	6	5	3.3	
Los Angeles	338	74	82	29.59	29.94	— .01	64.2	+ 0.5	83	9	75	47	30	54	32	56	53	78	0.26	— 0.5	3	3,040	w.	21	w.	29	14	12	5	3.9	
San Diego	87	94	102	29.83	29.93	— .03	63.1	— 0.1	72	22	68	50	30	58	21	57	53	73	0.30	— 0.1	3	3,810	nw.	19	nw.	21	23	5	3	2.9	
San Luis Obispo	201	10	46	29.78	30.00	+ .03	62.8	+ 0.8	96	9	74	43	30	51	42	54	48	68	1.93	+ 0.9	7	3,830	w.	23	n.	23	18	4	9	3.9	
West Indies.																															
Basseterre	29	41	54	29.91	29.94	......	81.2	......	89	6	86	68	23	76	15	75	73	78	7.25	......	21	5,952	e.	24	ne.	23	14	10	7	4.7	
Bridgetown	30	57	65	29.89	29.92	......	80.8	......	89	6	87	73	8	75	14	76	74	82	3 90	— 3.7	23	5.510	e.	25	s.	24	2	16	13	6.5	
Cienfuegos	52	62	67	29.87	29.92	......	78.8	......	90	16	87	68	26	71	19	74	72	87	10.17	......	16	4,097	ne.	27	e.	24	13	16	2	4.0	
Grand Turk	11	6	20	......	......	......	82.2	......	92	9	89	66	25	76	21	....	....	....	3.22	......	14	......	......	....	......	....	11	15	5	4.9	
Havana	57	87	105	29.88	29.94	......	79.6	......	90	4	86	70	27	73	17	74	73	84	1.95	— 5.5	16	6,490	e.	38	e.	5	4	16	11	6.4	
Kingston	286	38	52	29.59	29.89	......	79.0	......	90	18	87	68	25	71	18	73	71	81	1.48	......	12	3,747	ne.	21	se.	21	4	21	6	5.2	
Port of Spain	40	65	66	29.86	29.90	......	80.6	......	91	13	88	72	4	74	19	75	73	80	3.53	......	15	3,064	e.	18	ne.	28	2	17	12	7.1	
Puerto Principe	352	55	62	29.58	29.92	......	78.8	......	92	9	89	63	27	69	26	73	72	88	7.26	......	13	3,830	ne.	25	ne.	24	10	16	5	4.9	
Roseau	25	37	47	29.90	29.92	......	81.0	......	91	6	88	72	9	74	17	74	71	76	4.50	......	17	3,504	ne.	24	e.	14	10	12	9	5.4	
San Juan	82	48	73	29.86	29.94	......	80.0	......	90	7	86	70	24	74	15	75	73	82	8.11	+ 1.9	21	6,246	se.	33	ne.	22	10	16	5	4.8	
Santiago de Cuba	82	26	33	29.82	29.90	......	80.3	......	92	10	88	69	26	72	20	74	73	84	4.34	......	12	2,124	s.	15	ne.	24	7	19	5	5.5	
Santo Domingo	57	37	44	29.88	29.94	......	78.8	......	89	9	85	68	25	72	16	75	74	88	15.08	......	19	3,413	n.	19	se.	14	7	19	5	4.9	
Willemstad	75	39	46	29.78	29.85	......	82.4	......	89	30	87	72	15	78	13	76	74	78	1.72	......	8	7,860	e.	22	e.	16	7	16	8	5.4	

NOTE.—The data at stations having no departures are not used in computing the district averages. * Two or more dates. † Record for 21 days.

TABLE II.—*Climatological record of voluntary and other cooperating observers, October, 1900.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Alabama.					
Ashville	87	48	66.6	6.73	
Benton	......	......	......	3.98	
Bermuda	94	50	72.0	5.40	
Birmingham	88	49	69.4	7.18	
Brewton	96	53	73.8	6.48	
Bridgeport	......	......	......	5.57	
Burkeville	......	......	......	3.10	
Calera	......	......	......	7.01	
Citronelle	95	51	72.8	9.12	
Clanton	84	51	67.3	6.30	
Daphne	87	55	72.4	9.21	
Decatur	88	47	66.4	5.94	
Demopolis	......	......	......	4.42	
Eufaula *a*	94	50	70.4	5.50	
Eutaw	90	52	70.3	4.50	
Evergreen[1]	90	56	72.4	4.02	
Florence *a*	......	......	......	5.65	
Florence *b*	85	45	66.2	5.79	
Fort Deposit	92	53	70.3	5.10	
Gadsden	90	49	69.6	4.94	
Goodwater	93	50	69.4	8.74	
Greensboro	87	48	69.1	7.97	
Greenville	......	......	......	3.53	
Hamilton	85	46	67.4	4.89	
Healing Springs	92	50	69.2	3.03	
Helena	......	......	......	6.70	
Highland Home	88	51	70.5	4.36	
Letohatchie	......	......	......	3.63	
Livingston *a*	88	49	68.5	4.53	
Lock No. 4	85	49	67.0	4.83	
Madison Station	88	47	67.4	6.63	
Maplegrove	89	46	66.8	3.10	
Marion	93	50	71.0	4.40	
Natasulga	......	......	......	3.91	
Newbern	87	48	69.8	3.05	
Newton	91	47	66.4	3.52	
Oneonta	82	48	65.2	11.09	
Opelika	90	51	69.5	8.29	
Oxanna	87	47	68.9	3.52	
Pineapple	92	50	70.1	2.30	
Prattville	89	54	70.8	......	
Pushmataha	98	50	69.7	4.74	
Riverton	88	44	65.6	11.42	
Scottsboro	85	49	67.2	5.79	
Selma	94	51	70.5	4.36	
Talladega	......	48	......	5.92	
Tallassee	......	......	......	2.57	
Thomasville	90	50	69.4	5.78	
Tuscaloosa	88	46	67.4	5.40	
Tuscumbia	85	48	66.4	5.58	
Tuskegee	92	52	71.4	2.85	
Union Springs	92	53	71.0	5.24	
Uniontown	91	48	70.0	3.75	
Valleyhead	86	44	66.1	7.28	
Verbena	......	......	......	6.23	
Warrior	......	......	......	2.78	
Wetumpka	91	51	71.1	7.73	
Alaska.					
Coal Harbor	64	34	49.4	4.65	
Juneau	55	28	41.4	10.91	4.2
Killisnoo	54	28	39.4	6.00	
Sitka	58	28	42.6	10.73	
Arizona.					
Allaire Ranch	......	......	......	0.16	
Arivaca	92	32	65.9	0.41	
Aztec *[1]	98	47	75.4	0.24	
Bisbee	83	38	62.8	T.	
Blaisdell *[1]	102	46	73.6	T.	
Bowie *[5]	84	44	67.0	0.28	
Buckeye	95	31	69.0	0.20	
Casagrande *[1]	92	48	72.0	0.22	
Champie Camp	100	35	71.2	0.60	
Congress	88	46	69.6	0.31	
Dragoon Summit *[1]	78	40	59.1	0.90	
Dudleyville	96	27	65.9	0.39	
Fort Apache	79	20	55.2	0.77	
Fort Defiance	72	14	48.8	0.65	
Fort Grant	91	35	64.9	0.16	
Fort Huachuca	81	34	62.2	0.20	
Gilabend *[1]	97	46	74.3	0.00	
Ingleside[1]	94	36	67.6	......	
Jerome	81	37	61.7	1.30	
Maricopa *[1]	95	35	69.3	T.	
Mesa	95	35	70.4	0.23	
Mohawk Summit *[1]	97	57	74.7	0.50	
Mount Huachuca	83	32	63.2	0.22	
Natural Bridge	......	......	......	1.39	
Nogales	91	28	64.3	0.39	
Oracle	88	35	63.3	0.68	
Oro	......	......	......	0.64	
Pantano	......	......	......	0.00	
Parker	102	37	71.7	0.40	
Peoria	98	36	70.7	0.02	
Phoenix	95	31	69.0	0.20	
Pima	92	25	64.4	T.	
Pinal Ranch	......	......	......	0.93	
***Arizona*—Cont'd.**					
Prescott	81	16	53.7	0.62	
Sentinel *[1]	96	56	76.9	0.00	
Signal	99	34	67.8	0.06	
Silverking	......	......	......	1.11	
Strawberry	80	14	48.4	1.60	
Supai	92	35	63.8	0.25	
Tombstone	85	34	64.9	0.00	
Tonto	90	32	65.2	0.73	
Tuba	83	29	58.8	1.46	
Tucson	92	29	68.5	0.41	
Vail *[5]	90	47	71.8	0.50	
Willcox *[1]	95	40	72.2	0.17	
Winslow	80	20	54.2	0.89	
Yarnell	......	......	......	0.54	
Arkansas.					
Amity	92	45	67.6	4.70	
Arkadelphia	93	45	67.6	4.15	
Batesville	94	39	67.8	2.45	
Beebranch	92	42	66.8	3.75	
Blanchard Springs	92	41	67.1	3.99	
Brinkley	90	40	65.6	1.19	
Camden *a*	......	......	......	2.31	
Camden *b*	97	42	65.6	3.13	
Conway	90	44	68.0	3.69	
Corning	90	34	63.8	2.42	
Dallas	89	44	66.8	7.27	
Dardanelle	......	......	......	4.66	
Elon	94	42	68.2	5.66	
Fayetteville	87	36	63.2	4.64	
Forrest City	90	41	66.2	1.40	
Fulton	......	......	......	2.66	
Hardy	85	40	64.4	3.65	
Helena *a*	......	......	......	3.34	
Helena *b*	88	45	66.8	3.32	
Hot Springs *a*	......	......	......	5.74	
Keesees Ferry	88	37	64.8	4.65	
Lacrosse	87	41	65.0	3.09	
Lonoke	91	39	66.9	2.18	
Lutherville	86	45	64.3	5.27	
Malvern	85	40	65.9	3.74	
Marianna	86	42	65.8	1.80	
Marvell	89	42	67.0	2.48	
Mossville	82	40	60.8	7.41	
Mount Nebo	82	40	63.2	5.22	
New Gascony	87	44	66.6	4.47	
Newport *a*	......	......	......	3.19	
Newport *b*	91	39	65.8	3.51	
Newport *c*	91	36	65.8	3.21	
Oregon	88	38	64.4	4.66	
Osceola	90	44	67.2	3.86	
Ozark	88°	48°	67.6°	7.84	
Pinebluff	92	46	67.2	2.25	
Pocahontas	84	38	63.1	4.21	
Pond	85	34	62.2	3.36	
Prescott	94	46	68.3	7.32	
Rison	91	42	66.8	4.20	
Rosadale	92	43	68.3	4.84	
Russellville	87	43	65.6	6.95	
Silversprings	87	37	63.6	3.86	
Spielerville	89	40	65.0	8.43	
Stamps	92	45	67.3	4.23	
Stuttgart	91	41	66.6	4.02	
Texarkana	96	47	72.6	3.64	
Warren	92	43	67.3	4.98	
Washington	89	43	67.2	4.75	
Wiggs	89	43	65.1	5.10	
Winslow	80	36	61.2	7.41	
Witts Springs	89	41	64.4	5.94	
California.					
Angiola	95	26	60.8	T.	
Bakersfield	95	31	62.8	0.60	
Ballast Point L. H.	......	......	......	0.18	
Bear Valley	......	......	......	11.11	2.5
Bellevue	......	......	......	2.39	
Berkeley	82	44	59.1	1.41	
Bishop	......	......	......	0.03	
Boca *[1]	75	14	39.9	3.04	2.0
Bodie	63	1	38.8	1.34	13.0
Bowman	......	......	......	12.98	8.0
Branscomb	......	......	......	18.76	
Caliente *[1]	90	43	65.4	0.03	
Campbell	88	34	58.6	1.07	
Cape Mendocino L. H	......	......	......	9.10	
Cedarville	78	20	46.8	3.18	2.0
Chico *[1]	82	44	59.9	2.22	
Cisco *[1]	64	21	41.7	7.57	8.0
Claremont	92	37	62.2	0.59	
Corning *[1]	80	43	60.4	4.05	
Coronado	76	48	64.0	......	
Craftonville	95	36	65.0	0.40	
Crescent City	70	37	51.6	11.27	
Crescent City L. H	......	......	......	9.67	
Cuyamaca *[5]	70	29	51.1	0.74	
Delano *[1]	90	35	64.9	0.00	
Delta *[1]	86	38	57.7	15.68	
Deweyville	94	32	68.2	T.	
***California*—Cont'd.**					
Drytown	86	32	58.8	2.03	
Dunnigan *[1]	87	42	63.2	1,01	
Durham *[1]	85	42	60.2	3.50	
East Brother L. H	......	......	......	0.85	
Edmanton *[1]	74	26	47.1	12.51	T.
Elcajon	90	33	63.5	0.30	
Elmdale	100	31	60.4	0.61	
Elsinore	100	37	65.1	0.06	
Escondido	85	25	59.4	0.30	
Fallbrook	86	41	62.2	0.23	
Fordyce Dam	......	......	......	10.94	17.0
Fort Ross	74	42	56.1	7.31	
Fort Tejon	......	......	......	1.06	
Georgetown	81	32	55.4	5.49	
Gilroy (near)	96	29	60.2	1.25	
Goshen *[1]	87	46	65.0	0.05	
Grand Island *[5]	88	40	62.6	1.47	
Grass Valley	......	......	......	6.30	
Greenville	79	21	48.9	6.28	1.0
Hanford	93	28	60.8	0.20	
Healdsburg	90	32	58.4	4.82	
Hollister	94	32	59.5	1.13	
Humboldt L. H	......	......	......	7.66	
Indio *[1]	97	45	72.2	1.04	
Iowa Hill *[1]	80	36	55.8	5.67	
Irvine	90	50	69.6	0.20	
Jackson (near)	80	32	56.4	2.74	
Jolon	......	......	......	2.00	
Kennedy Gold Mine	80	31	55.6	2.70	
Kent	......	......	......	5.93	
Kernville	......	......	......	0.10	
Kingsburg *[1]	89	45	66.4	0.18	
Kono Tayee	76	40	58.4	3.11	
Lamesa	......	......	......	0.37	
Lankershim	......	......	......	0.90	
Laporte *[1]	69	26	44.5	13.02	6.5
Legrand	89	35	62.2	2.18	
Lemoncove	95	33	65.7	T.	
Lick Observatory	77	31	51.6	3.48	
Lime Point L. H	......	......	......	1.36	
Lodi	86	38	60.4	1.83	
Los Gatos *b*	89	40	60.1	2.39	
Mammoth *[1]	95	58	73.8	0.26	
Manzana	87	36	61.4	0.09	
Mare Island L. H	......	......	......	1.08	
Merced *b*	91	30	61.0	0.81	
Mills College	......	......	......	2.09	
Milo	......	......	......	0.19	
Milton (near)	88	38	62.4	1.15	
Modesto *[1]	95	42	67.2	0.72	
Mohave *[1]	85	40	60.3	0.00	
Mokelumne Hill *[3]	......	38	56.7	2.25	
Monterio	78	32	58.2	1.71	
Monterey *[5]	79	40	59.1	1.03	
Morena	90	31	59.4	0.81	
Mountainview	......	......	......	0.97	
Napa *b*	91	37	60.6	1.50	
Nevada City	75	30	52.2	5.52	
Newhall. *[1]	95	35	68.0	0.08	
Niles *[1]	90	44	61.8	2.02	
North Bloomfield	75	32	52.8	8.32	T.
North Ontario	88	42	61.6	0.40	
North San Juan	......	......	......	7.77	
Oakland *a*	80	44	59.2	1.60	
Ogilby *[5]	102	60	81.1	0.00	
Oleta *[1]	80	36	54.4	2.76	
Orland *[1]	88	42	57.6	3.20	
Palermo	89	35	60.5	8.43	
Paso Robles *b*	90	27	59.8	1.54	
Peachland *[5]	84°	39	59.2°	6.09	
Piedras Blancas L. H	......	......	......	3.74	
Pigeon Point L. H	......	......	......	1.27	
Pilot Creek	......	......	......	8.02	
Pine Crest	88	49	64.2	0.08	
Point Ano Nuevo L. H	......	......	......	2.68	
Point Arena L. H	......	......	......	4.68	
Point Bonita L. H	......	......	......	2.99	
Point Conception L. H	......	......	......	0.18	
Point Firmin L. H	......	......	......	0.35	
Point George L. H	......	......	......	3.86	
Point Hueneme L. H	......	......	......	0.00	
Point Lobos	70	47	56.2	1.26	
Point Loma L. H	......	......	......	0.09	
Point Montara L. H	......	......	......	3.37	
Point Pinos L. H	......	......	......	1.24	
Point Sur L. H	......	......	......	2.18	
Pomona (near)	96	38	63.8	0.34	
Poway *[3]	84	36	58.8	0.25	
Quincy	76	24	49.6	7.33	1.0
Ranch House	......	......	......	0.19	
Redding	85	37	59.9	6.47	
Redlands	94	39	63.9	0.53	
Reedly	95	34	62.6	0.00	
Represa	80	38	59.8	2.26	
Riovista	85	42	61.7	1.59	
Riverside	96	40	64.4	0.28	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Roe Island L. H				0.53	
Rosewood	85	32	56.6	3.46	
Sacramento *a*	80	36	59.0	2.03	
Salinas*1	78	40	69.0	0.16	
Salton*1	106	50	78.9	0.20	
San Bernardino	98	31	63.6	0.36	
San Jacinto	94	32	62.4	0.42	
San Leandro*5	84	38	58.4	1.78	
San Luis L. H				1.37	
San Mateo*1	84	45	60.7	1.64	
San Miguel*1	88	38	62.1	0.60	
Santa Barbara *a*	83	47	62.8	0.15	
Santa Barbara L. H				0.22	
Santa Clara *a*				1.02	
Santa Cruz *b*	92	33	57.8	2.11	
Santa Cruz L. H				1.90	
Santa Maria	93	42	62.9	0.65	
Santa Monica				0.02	
Santa Paula	91	41	63.4		
Santa Rosa*5	85	37	57.1	4.41	
Shasta	86	38	61.6	8.91	
Sierra Madre	89	46	63.6	0.58	
Sonoma				2.54	
S. E. Farallone L. H				2.01	
Stanford University	83	38	57.9	2.01	
Stockton	83	50	63.4	0.97	
Summerdale	76	24	49.1	9.57	
Susanville	68	25	45.7	2.67	T.
Tehama*1	89	42	58.9	3.61	
Tejon Ranch	89	40	64.0	0.67	
Templeton*1	88	38	60.1	1.58	
Thermalito	90	39	61.8	2.59	
Trinidad L. H				6.49	
Truckee*1	76	24	43.0	1.02	
Tulare *b*				T.	
Tulare *c*	96	30	62.7	0.04	
Ukiah	86	31	56.1	5.00	
Upperlake	88	33	56.2	3.96	
Upper Mattole*1	83	40	53.2	15.02	
Vacaville*1	90	45	62.5	1.32	
Ventura	80	47	62.2	0.25	
Visalia *b*	95	31	62.2	0.10	
Volcano Springs*1	102	53	76.2	0.60	
Walnutcreek	86	38	62.9	1.38	
Westpoint				4.20	
West Saticoy				0.25	
Wheatland	84	36	59.4	2.19	
Williams*1	87	41	63.2	0.61	
Wilmington*1	81	50	62.9		
Wire Bridge*5	83	37	60.2	4.00	
Yerba Buena L. H				1.00	
Yreka	75	29	49.4	3.66	
Yuba City	86	50	66.3	2.17	
Colorado.					
Alford	80	6	47.8	0.20	
Arkins				0.18	
Blaine	90	29	60.7	0.77	
Boulder	83	25	57.2	0.13	T.
Boxelder				0.00	
Breckenridge	62	−1	34.0	0.60	8.2
Buenavista				0.50	
Canyon	82	18	55.2	0.62	3.0
Castlerock	82	8	50.7	0.40	1.0
Cedaredge	75	18	51.6	1.40	T.
Cheyenne Wells	86	23	55.0	0.22	
Clearview	65	10	41.4	1.36	1.0
Collbran				0.97	T
Colorado Springs	79	14	52.2	0.53	2.0
Cope	85	22	54.8	0.02	
Cripplecreek	66	21	46.8	0.36	4.0
Crook	88	18	55.3	0.00	
Delta	84	15	51.9	0.38	
Dumont				0.82	T.
Durango	76	6	46.6	0.55	T.
Fort Collins	83	12	50.4	0.24	
Fort Morgan	84	13	51.8	0.00	
Fox				0.02	
Gilman				1.94	13.5
Gleneyrie	75	16	51.0	0.83	2.0
Greeley	81	14	52.0	0.11	T.
Grover				T.	
Hamps	78	13	51.0	0.09	T.
Hoehne	85	10	54.6	1.71	4.0
Holly	92	28	58.8	0.06	
Holyoke (near)	89	20	53.6	0.00	
Hugo				0.00	
Lake Moraine	61	0	38.4	1.65	21.0
Lamar	91	28	59.2	0.08	
Laporte				0.25	
Las Animas	88	25	57.1	0.40	
Lay	73	12	45.4	1.29	5.0
Leadville (near)*1	60	5	37.6	0.75	9.0
Leroy	84	17	53.7	0.07	
Longs Peak	64	14	40.4	1.14	1.0
Mancos	73	9	47.4	0.46	
Marshall Pass				0.22	3.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mitchell				1.35	10.8
Moraine	67	15	43.7	1.42	
Pagoda	76	6	46.3	2.35	11.0
Parachute	80			1.36	
Rockyford	88	26	55.6	0.60	
Rogers Mesa	78	20	53.0	1.07	
Ruby				2.95	24.0
Saguache	78	10	46.7	0.05	T.
Salida	80	7	49.0	0.14	T.
San Luis	73	9	46.2	0.50	2.0
Santa Clara	79	8	48.0	2.75	7.0
Sapinero				0.80	
Sargents				0.28	
Seibert				0.10	
Silt	76	15	51.4	0.80	
Springfield				0.98	T.
Strickler Tunnel				1.90	14.5
Sugarloaf	78	14	42.5	0.60	T.
Trinidad	83	15	55.8	1.56	4.0
Troutvale	61	0	36.4	0.39	3.5
T. S. Ranch	76	19	52.8	0.87	T.
Twinlakes				5.00	T.
Vilas				1.07	
Wagon Wheel	65	2	38.7	0.10	T.
Walden	68	7	40.9	0.10	0.5
Wallet				0.00	
Westcliffe	66	3	44.4	2.09	1.5
Wray	89	22	54.5	0.03	
Yuma				0.03	T.
Connecticut.					
Bridgeport	80	26	56.8	2.97	
Canton	85	20	55.4	4.15	
Colchester	80	23	56.8	3.92	
Falls Village				2.41	
Hartford *b*	77	30	56.0	3.14	
Hawleyville	80	23	56.6	4.25	
Lake Konomoc				2.91	
Middletown	82	23	57.4	3.82	
New London	77	32	58.3	1.59	
North Grosvenor Dale	83	23	54.8	4.10	
Norwalk	81	23	57.0	3.47	
Southington	79	24	57.0	2.95	
Storrs	80	25[j]	53.5[e]	3.00	
Voluntown	80[d]	19[d]	56.8[d]	2.80	
Wallingford				2.82	
Waterbury	85	23	58.0	3.59	
West Cornwall	83	26	54.6	2.73	
West Simsbury				3.64	
Winsted*1	80	22	53.4		
Delaware.					
Milford				5.30	
Millsboro	84	32	61.0	2.71	
Newark	85	31	59.9	1.44	
Seaford	84	34	61.6	2.50	
Wyoming				3 52	
District of Columbia.					
Distributing Reservoir*5	80	35	61.9	1.35	
Receiving Reservoir*5	80	36	61.6	1.52	
West Washington	87	32	61.6	1.48	
Florida.					
Archer	92	56	76.2	2.13	
Bartow	90	65	77.0	2.40	
Brooksville	88	64	76.0	4.02	
Carrabelle	87	55	73.2	9.89	
Clermont	92	63	77.0	4.63	
Dalkeith	94	51	73.0	6.40	
De Funiak Springs	95	51	72.6	4.82	
Deland	91	61	77.2		
Earnestville	92	62	77.2	4.55	
Eustis	93	62	77.8	4.84	
Federal Point	87	61	74.6	9.99	
Fort George*1	86	67	77.0		
Fort Meade	92	63	76.7	4.31	
Gainesville	92	58	76.2	2.39	
Huntington	89	58	74.0	3.54	
Hypoluxo	95	62	79.3	14 20	
Inverness	89	60	77.0	3.19	
Jasper	89	49	72.8	3.43	
Kissimmee	91	64	76.8	4.83	
Lake Butler	91	57	75.6	3.16	
Lake City	93	53	75.4	3.15	
McAlpin	94	50	75.1	3.45	
Macclenny	93	54	75.1	3.07	
Manatee	89	63	76.0	3.30	
Marianna	94	50	71.6	8.09	
Merritt Island	88	70	78.4	5.23	
Micanopy	92	57	76.1	2.20	
Middleburg	89	52	71.9	7.54	
Myers	87	67	76.4	10.33	
New Smyrna	89	62	76.3	4.72	
Nocatee*	94	60	77.0		
Ocala	95	56	76.2	4.89	
Orange City	89	61	76.1	4.86	
Orlando	88	66	76.6	6.78	
Plant City	92	61	77.0		
Rockwell	90	60	76.8	2.46	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Florida—Cont'd.	°	°	°	*Ins.*	*Ins.*
St. Andrews	93	51	73.4	12.19	
St. Augustine	88	62	76.4	9.84	
St. Francis	88	59	74.9	2.96	
Sebastian	85	70	77.4	4.21	
Stephensville*1	90	55	73.8	2.48	
Sumner	94	56	76.5	2.29	
Switzerland*1	85	63	72.8	7.45	
Tallahassee	90	56	72.0	5.48	
Tarpon Springs	87	59	74.6	3.93	
Georgia.					
Adairsville	83	50	66.2	5.25	
Albany	96	52	72.2	4.56	
Allapaha	95	48	71.0	2.69	
Allentown	94	47	70.9	3.61	
Americus	92	50	70.1	3.77	
Athens *b*	87	46	66.6	4.80	
Bainbridge	93	50	71.2	3.39	
Bellville	96	50	73.4	3.63	
Blakely	96	50	71.8	6.40	
Brent	90	50	69.8	4.38	
Camak	90	45	68.5	3.47	
Canton				6.31	
Carlton				3.86	
Clayton	89	41	68 4	6.28	
Columbus	91	54	71.1	5.38	
Covington	84	45	66.6	1.90	
Dahlonega	88	38	62.2	4.47	
Diamond	82	44	63.4	5.15	
Dublin				3.45	
Eastman	95	50	70.8	2.02	
Elberton	82	48	67.4	6.61	
Experiment	84	49	67.2	3.48	
Fitzgerald	91	47	70.4	2.95	
Fleming	89	43	69.9	6.45	
Fort Gaines	93	51	70.7	3.43	
Franklin	89	54	69.0	6.48	
Gainesville	84	46	64.8	2.66	
Gillsville	92	43	66.2	4.07	
Greenbush	85	43	66.4	5.88	
Griffin	93	49	68.0	4.18	
Harrison	90	45	69.3	3.03	
Hawkinsville	89	54	70.8	1.75	
Hephzibah				3.20	
Jesup	87	40	70.0	5.33	
Lost Mountain	85	49	67.4	6.48	
Lumpkin	93	53	71.2	4.33	
Marshallville	89	54	71.0	2.68	
Mauzy	94	47	72.4	3.93	
Millen	95	44	70.1	3.89	
Morgan	93	47	68.5	3.08	
Naylor	95	46	73.4	3.00	
Newnan	86	49	66.8	3.08	
Oakdale				2.92	
Point Peter	88	50	69.2	2.89	
Poulan	93	46	70.8	2.07	
Putnam	92	50	69.2	4.03	
Quitman	96	48	71.2	3.25	
Ramsey	86	47	66.0	6.74	
Resaca				5.58	
Rome	85	48	66.4	5.01	
Statesboro	90	47	70.9	2.68	
Talbotton	88	48	66.2	3.84	
Tallapoosa	82	47	65.9	4.72	
Thomasville	97	51	73.2	2.80	
Toccoa	90	54	69.6	5.20	
Union Point	87	43	68.0	3.42	
Valona	88	50	72.4	9.64	
Washington	92	47	68.5	2.89	
Waycross	92	48	70.8	2.83	
Waynesboro	92	41	65.9	2.05	
Westpoint	89	52	68.8	6.15	
Woodbury				4.00	
Idaho.					
Albion	77	16	46.8	1.25	
American Falls	75	17	45.3	1.34	
Blackfoot		18		0.70	T.
Burnside	77	14	47.7	0.70	4.5
Chesterfield	78	5	37.8	1.07	2.0
Downey	75	15	46.6	1.80	
Forney	68	10	40.7	2.18	1.2
Garnet	84	26	52.8	1.27	
Hagerman	87	24	51.8	1.13	
Hailey	74	23	46.7	2.61	
Kootenai	68	15	41.0	4.89	
Lakeview	66	27	46.3	5.04	
Lost River	70	18	43.4	0.52	T.
Murray	68	26	43.9	5.03	T.
Oakley	76	22	47.5	0.66	
Ola	80	25	47.2	3.06	
Paris	78	20	45.6	0.80	
Payette	85	19	51 6	1.80	
Pollock	75	28	49.9	2.15	
Priest River	64	27	44.4	5.07	T.
St. Maries	75	25	47.8	4.62	
Salubria	78	22	45.7	2.76	1.8
Soldier	72	18	42.1	2.07	2.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Swan Valley	72	18	42.8	1.58	6.5
Weston	75[j]	23[j]	45.7[j]	2.04	3.0
Illinois.					
Albion	86	38	63.7	2.28	
Alexander	88	32	62.8	2.86	
Ashton	95	29	59.5	2.80	
Astoria	85	30	60.0	2.90	
Aurora *a*	88	31	60.4	2.83	
Bloomington	90	31	63.2	2.62	
Bushnell	89	34	62.6	2.90	
Cambridge	84	35	60.8	2.72	
Carlinville	88	32	62.8	2.42	
Carlyle	.....	.....	.....	2.83	
Centralia	92	32	61.8	1.15	
Charleston	88	32	63.0	3.63	
Chemung	84	27	57.8	2.57	
Chester	.....	.....	.....	1.53	
Cisne	89	34	64.2	1.63	
Coatsburg	86	34	61.6	4.07	
Cobden	93	36	64.9	2.20	
Danville	87	29	60.4	2.01	
Decatur	89	31	62.7	1.33	
Dixon	88	31	60.9	3.41	
Dwight	87	27	60.3	1.69	
Effingham	87	34	62.2	2.94	
Elgin	85	29	58.0	2.80	
Equality	92	33	64.8	1.50	
Flora	86	36	63.0	2.24	
Friendgrove *[5]	90	40	67.1	1.90	
Galva	86	32	61.6	2.61	
Glenwood *[5]	82[e]	36[e]	61.4[e]	1.31	
Grafton	.....	.....	.....	1.78	
Grayville	85[d]	38[d]	64.8[d]	1.52	
Greenville	91	36	65.4	2.04	
Griggsville	89	35	63.4	2.80	
Halfway	88	35	64.7	0.73	
Halliday	93	29	62.2	1.11	
Havana	.....	34	.....	2.00	
Henry	86	29	60.8	3.94	
Hillsboro	90	34	63.2	3.02	
Joliet	86	33	60.6	1.61	
Kishwaukee	88	27	58.9	3.64	
Knoxville	88	30	58.4	2.94	
Lagrange	86	31	59.2	1.12	
Laharpe	87	30	60.9	4.70	
Lanark	86	23	57.7	2.32	
Loami	.....	.....	.....	3.10	
McLeansboro	89	34	63.0	1.53	
Martinsville	85	36	62.7	2.15	
Martinton	90	27	61.8	1.82	
Mascoutah	87	32	62.7	1.99	
Mattoon	90	42	67.0	3.00	
Minonk	88	28	61.4	2.24	
Monmouth	87	28	59.8	2.86	
Monticello	92	31	62.6	2.50	
Morrisonville	88	33	63.2	3.11	
Mount Carmel	.....	.....	.....	1.61	
Mount Pulaski	90	35	63.8	2.96	
Mount Vernon	92	31	63.0	1.56	
New Burnside	91	34	65.1	2.74	
Olney	91	35	63.9	1.58	
Ottawa	89	32	62.7	2.24	
Palestine	89	30	62.0	1.59	
Pana	88	34	62.8	2.00	
Paris	89	34	63.2	4.04	
Peoria *a*	.....	.....	.....	2.56	
Peoria *b*	87	35	61.9	2.90	
Philo	89	28	60.9	2.26	
Plumhill	92	31	63.5	1.90	
Rantoul	89	33	62.3	2.32	
Raum	88	45	66.0	1.41	
Riley	84	32	59.6	2.74	
Robinson	90	34	64.0	2.41	
Roundgrove	86	28	59.0	2.75	
Rushville	89	33	62.8	3.76	
St. Charles *[1]	85	30	59.8	2.36	
St. John	94	32	64.8	1.12	
Shobonier	90	30	63.2	3.20	
Strawn	89	28	62.0	1.64	
Streator	90	30[d]	62.4	2.18	T.
Sullivan	88	32	62.0	3.12	
Sycamore	83	29	58.6	2.27	
Tilden	89	32	62.8	3.30	
Tiskilwa	82	35	60.8	2.89	
Tuscola	90	31	62.2	2.99	
Walnut	89[e]	36[d]	62.7[d]	3.48	
Wheaton *[5]	.....	40	57.0	2.29	
Winchester	86	33	61.2	3.07	
Winnebago	86	28	59.8	3.70	
Yorkville	91[d]	33[d]	61.0[d]	2.83	
Zion	86	27	59.0	1.21	
Indiana.					
Anderson	88	31	62.0	1.85	
Angola	85	30	60.0	4.35	
Auburn	84	27	57.0	2.44	
Bloomington	86	35	62.0	4.00	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Indiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bluffton	89	27	60.4	2.74	
Bright	87	35	63.1	2.66	
Butlerville	90	32	63.8	1.52	
Cambridge City	86	28	58.8	1.60	
Columbus	92	32	64.2	1.75	
Connersville	87	31	61.3	2.46	
Crawfordsville	94	.....	.....	3.23	
Delphi	90	28	60.4	3.62	
Edwardsville *[1]	86	41	66.6	2.37	
Fairmount	93	26	60.1	2.52	
Farmland	84	29	59.3	1.84	
Fort Wayne	89	28	59.8	2.83	
Franklin *[1]	87	34	61.2	1.80	
Greencastle	85	35	61.8	3.08	
Greensburg	87	29	61.7	2.24	
Hammond	88	40	61.8	1.52	
Hector	86	29	60.8	1.35	
Huntington	86	31	59.6	2.64	
Jeffersonville	88	39	64.4	2.51	
Knightstown	89	30	61.7	1.30	
Kokomo	86	32	61.4	2.21	
Lafayette	88	32	62.2	3.43	
Laporte	92	30	61.0	1.84	
Logansport	86	32	60.4	3.20	
Madison *a*	89	35	63.6	1.73	
Madison *b*	.....	.....	.....	1.91	
Marengo	88	33	61.9	3.05	
Marion	90	29	61.2	2.42	
Markle	89	27	60.4	1.50	
Mauzy	89	30	61.8	1.96	
Northfield	87	28	59.5	2.15	
Paoli	96	33	63.8	3.74	
Peru	87	29	60.4	3.22	
Prairie Creek	.....	.....	.....	3.70	
Princeton	89	32	62.6	1.39	
Rensselaer	92	30	60.3	0.70	
Richmond	88	29	60.8	1.59	
Rockville	89	33	62.8	3.23	
Salem	95	29	63.7	2.58	
Scottsburg	88	33	64.0	2.34	
Seymour	88	37	64.6	3.90	
Shelbyville	88	35	62.7	1.75	
South Bend	88	30	61.4	1.31	
Syracuse	91	29	60.6	4.05	
Terre Haute	88	35	63.4	3.33	
Topeka	86	28	59.4	3.27	
Valparaiso	88	34	60.6	0.50	
Veedersburg	90	31	62.6	3.30	
Vevay	89	37	63.6	2.00	
Vincennes	93	36	64.2	1.57	
Washington	80	37	60.6	2.04	
Winamac	.....	.....	.....	2.02	
Worthington	91	31	63.6	2.77	
Indian Territory.					
Bengal	89	37	65.2	6.32	
Claremore	90	38	65.2	2.92	
Colbert	95	.....	.....	5.16	
Fairland	88	37	64.4	2.36	
Hartshorne	92	40	68.0	5.59	
Healdton	95	34	66.8	4.98	
Lehigh	92	39	67.6	6.27	
Marlow	91	39	66.8	2.63	
Muscogee	92	38	65.2	5.78	
Pauls Valley	91	35	67.2	6.41	
Ryan	91	40	66.9	5.37	
South McAlester	.....	.....	.....	5.98	
Tahlequah	87	40	65.8	7.55	
Tulsa	.....	.....	.....	4.06	
Wagoner	91	40	65.9	5.60	
Webbers Falls	91	40	66.5	6.84	
Iowa.					
Afton	85	30	59.0	6.90	
Albia	85[d]	31[d]	59.3[d]	3.55	
Algona *[1]	82	36	58.2	4.15	
Alta *a*	82	31	57.7	2.61	
Amana	84	30	59.0	3.79	
Ames *b*	87	31	59.8	3.73	
Ames (near)	.....	.....	.....	4.75	
Atlantic	87	24	58.8	5.15	
Audubon	87	25	57.5	3.72	
Bancroft	85	31	57.2	3.50	
Batavia	.....	.....	.....	3.60	
Baxter	88	32	59.6	4.33	
Bedford	90	27	59.6	6.94	
Belknap	87	34	61.1	2.87	
Bonaparte	87	30	61.8	3.28	
Britt	86	25	57.4	3.97	
Buckingham	.....	.....	.....	4.03	
Bussey	.....	.....	.....	3.52	
Carroll	86	30	59.3	3.96	
Cedar Rapids	88	33	60.6	4.12	
Chariton	85	34	60.4	4.72	
Charles City	84	29	57.4	2.97	
Clarinda	89	29	60.2	7.85	
Clearlake	85	35	58.6	3.50	
Clinton	87	28	59.2	2.73	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
College Springs	87	31	59.3	8.00	
Columbus Junction	87	33	61.9	2.89	
Coon Rapids	84	33	59.6	3.48	
Corning	84	30	59.2	6.68	
Council Bluffs	89	29	60.4	5.99	
Crawfordsville	.....	.....	.....	3.66	
Cresco	84	27	56.0	4.83	
Cumberland	.....	.....	.....	4.40	
Danville	.....	.....	.....	2.30	
Decorah	84	29	57.8	5.36	
Delaware	85	28	57.4	3.60	
Denison	85	28	59.1	6.39	
Desoto	84	31	59.6	3.19	
Dows	87	25	58.6	4.05	
Eldon	88	30	61.6	4.28	
Elkader	89	28	59.0	4.08	
Emerson	.....	.....	.....	3.20	
Estherville	85	29	56.0	3.00	
Fayette	85	26	57.2	3.68	
Forest City	86	30	58.7	4.11	
Fort Dodge	87	29	59.4	3.58	
Fort Madison	.....	.....	.....	4.19	
Galva	85	26	57.8	4.30	
Gilman	.....	.....	.....	4.67	
Glenwood	87	29	61.5	5.85	
Grand Meadow *[1]	84	35	58.0	4.26	
Greene	85	29	58.6	2.31	
Greenfield	86	33	60.3	5.86	
Grinnell	83	35	60.0	4.73	
Grinnell (near)	85	34	60.6	4.76	
Grundy Center	86	31	59.6	4.89	
Guthrie Center	89	28	60.5	3.76	
Hampton	89	30	60.2	4.59	
Harlan	85	27	58.2	4.32	T.
Hawkeye	.....	.....	.....	5.22	
Hedrick	85[e]	29[e]	59.8[e]	2.80	
Hopeville	85	35	60.6	5.78	
Hoprig	.....	.....	.....	2.91	
Humboldt	85	30	59.0	3.67	
Independence	85	30	58.3	4.20	
Indianola	86	33	60.6	4.55	
Iowa City	88	31	60.8	3.61	
Iowa Falls	86	27	57.0	3.77	
Keosauqua	87	33	62.0	4.92	
Knoxville	87	32	58.9	4.86	
Lacona	.....	.....	.....	5.45	
Lansing	88	32	58.8	4.62	
Larchwood	.....	.....	.....	1.75	
Larrabee	87	29	57.2	1.54	
Leclaire	.....	.....	.....	1.60	
Lemars	84	29	57.3	1.69	
Lenox	83	33	59.8	7.27	
Logan	84	24	58.3	4.60	
Maple Valley	.....	.....	.....	3.06	
Maquoketa	84	27	59.2	4.64	
Marshalltown	88	30	60.2	4.46	
Monticello	87	26	57.7	5.00	
Mooar	87	29	58.5	5.26	
Mountayr	87	34	60.3	5.69	
Mount Pleasant	89	32	60.7	3.40	
Mount Vernon *b*	85	31	60.0	3.56	
Murray	.....	.....	.....	5.34	
New Hampton	83	34	58.4	3.20	
Newton	89	33	59.4	4.23	
Northwood	81	30	56.6	4.37	
Odebolt	84	28	59.2	6.23	
Ogden	87	29	60.2	3.17	
Onawa	87	28	60.2	4.11	
Osage	80	32	56.1	3.20	
Osceola	86	34	60.4	5.95	
Oskaloosa	87	30	59.8	3.60	
Ottumwa	87	35	61.3	5.75	
Ovid	86	31	60.2	4.41	
Pacific Junction	88	29	60.8	3.94	
Pella	88	33	60.6	3.71	
Perry	86	31	60.2	2.72	
Pioneer	.....	.....	.....	2.60	
Plover	86	21	56.5	3.68	
Primghar	80	35	59.0	1.71	
Redoak	86	32	61.7	4.95	
Ridgeway	83	31	59.0	6.72	
Rockwell City	84	32	58.4	3.49	
Ruthven	86	31	58.2	3.45	
Sac City	85	32	58.8	4.52	
Scranton	86[e]	35[e]	59.2[e]	2.59	
Sheldon	81	29	56.8	1.70	
Sibley	87	26	58.0	1.20	T.
Sigourney	88	30	61.1	3.81	
Sioux Center	86	31	57.4	2.96	
Spirit Lake	88[d]	34[d]	59.7[d]	1.51	
Storm Lake	82	36	58.1	3.32	
Stuart	86	33	60.3	4.28	
Thurman	86	28	59.8	4.98	
Toledo	90	28	60.8	2.95	
Villisca	89	28	59.8	7.40	
Vinton *[1]	86	32	58.3	3.49	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Wapello	82	29	59.6	1.95	
Washington	87	30	59.6	4.12	
Washta	......	......	......	3.42	
Waterloo	87	30	58.6	4.14	
Waverly	85	32	59.4	3.40	
Westbend *[1]	85	31	55.8	4.35	
Westbranch	89	29	56.8	4.10	
West Union	......	......	......	3.45	
Whitten	84	29	57.8	4.24	
Wilton Junction	86	28	59.7	2.69	
Winterset	89	31	60.5	4.30	
Kansas.					
Abilene	89	34	61.7	4.46	
Achilles	97	23	58.0	0.11	
Altoona	90	37	63.8	2 63	
Anthony	......	......	......	2.53	
Atchison *a*	88	34	61.7	3.21	
Burlington	88	34	62.4	5.59	
Campbell	87	29	62.0	2.65	
Chanute	90	......	......	3.10	
Columbus	88	36	62.2	2.53	
Delphos	89	31	62.4	2.54	
Dresden	94	30	58.4	0.13	
Ellinwood	90	30	60.8	1.23	
Emporia	90	38	61.4	4.55	
Englewood	94	28	61.8	1.14	
Eureka	......	......	......	4.58	
Eureka Ranch	92	29	60.9	0.80	
Fallriver	87	34	62.8	2.81	
Fanning	88[f]	30[f]	60.3[f]	3.91	
Frankfort	91	28	62.2	2.91	
Garden City	91	31	60.4	0.52	
Gove	......	......	......	0.00	
Grenola	88	32	62.4	3.65	
Hays	96	30	60.2	1.95	
Horton	86	36	61.6	3.87	
Hoxie	91	27	59.0	0.25	
Hutchinson	92	30	62.8	3.37	
Independence	88	39	63.8	1.99	
Lakin	91	30	60.0	0.14	
Lawrence	85	37	61.8	3.57	
Lebanon	90[c]	26[c]	60.4[c]	2.30	
Lebo	86	38	61.8	5.10	
Little River	......	33	......	3.22	
Macksville	91	30	61.6	1.89	
McPherson	89	34	62.2	4.92	
Madison	89	32	61.2	5.56	
Manhattan *b*	92	33	63.0	2.22	
Manhattan *c*	93	30	63.8	2.21	
Marion	86	36	62.0	3.10	
Medicine Lodge	92	31	62.2	2.71	
Minneapolis	90	30	60.3	3.21	
Moran	85	37	61.8	3.20	
Mounthope *[1]	88	36	61.9	2.70	
Ness City	92	34	62.6	0.59	
Newton	88	33	60.2	3.87	
Norwich	92	36	63.6	3.05	
Olathe	87	35	62.6	3.97	
Osage City	89	32	62.6	3.55	T.
Oswego	92	38	65.7	2.19	
Ottawa	88	32	60.6	4.89	
Phillipsburg	94	30	61.6	1.66	
Pratt	93	32	62.3	1.91	
Rome	91	35	63.9	3.80	
Salina	88	34	61.6	3.66	
Sedan	86	34	61.9	1.71	
Seneca	90	30	61.8	4.21	
Toronto	89	36	62.2	4.07	
Tribune	89	22	53.6	0.03	
Ulysses	92	28	50.8	0.55	
Valley Falls	86	34	62.6	2.49	
Viroqua	92	32	59.2	1.38	
Wakeeney (near)	86	36	60.4	0.70	
Wallace	......	......	......	0.22	
Wamego *[1]	90	35	60.9	2 67	
Winfield	87	36	62.1	2.23	
Yates Center	87	35	61.7	3.93	
Kentucky.					
Alpha *[3]	......	44	65.0	1.57	
Bardstown	94	31	65.7	1.38	
Blandville	88	39	64.8	4.04	
Bowling Green	89	38	65.4	2.65	
Burnside	......	......	......	1.13	
Carrollton	89	34	64.9	1.54	
Catlettsburg	89	29	61.9	1.29	
Earlington	88	38	65.5	3.82	
Edmonton	90	34	65.2	1.22	
Eubank	86	33	62.4	1.50	
Falmouth	......	......	......	2.31	
Fords Ferry	91	31	64.9	2 94	
Frankfort	85	36	63.0	2.45	
Georgetown	85	33	64.0	......	
Greensburg	90	32	63 6	1.23	
Henderson	88	41	64 5	3.78	
Hopkinsville	89	37	64.6	6.78	
Irvington [j]	86	44	65.0	0.50	
Kentucky—Cont'd.	°	°	°	*Ins*	*Ins.*
Leitchfield	88	34	63.7	2.91	
Loretto	89	30	63.6	2.43	
Marrowbone	87	36	63 5	2.01	
Maysville	93	31	64.8	1.08	
Middlesboro [i]	82	41	62 6	1.42	
Mount Sterling	86	34	62.8	1.43	
Owensboro	86	37	64.6	4.25	
Owenton	91	36	65.2	1.57	
Paducah *a*	......	......	......	2.06	
Paducah *b*	94	40	67.4	2.88	
Pikeville	89[h]	40[h]	68.4[h]	1.86	
Princeton	90	35	64.0	3.91	
St. John	88	33	63.2	2.25	
Scott	91	33	64.2	1.40	
Shelby City	92	31	64.6	0.57	
Shelbyville	90	30	65.0	2.07	
Vanceburg	85	33	60.2	1.20	
Warfield	88	33	65.0	1.89	
Williamsburg	88	44	66.6	1.87	
Louisiana.					
Abbeville	93	53	72.5	2.10	
Alexandria	98	48	72.4	3.30	
Amite	98	50	71.2	3.80	
Baton Rouge	94	52	71.8	2.21	
Burnside	94	50	71.6	4.46	
Calhoun	......	......	......	2.43	
Cheneyville	96	47	71.0	2.35	
Clinton	94	48	70.9	2.90	
Como	94[c]	45[c]	69.3[c]	1.85	
Covington	93	52	70.0	5.84	
Donaldsonville	100	54	73.5	4.90	
Emilie	90	53	71.2	6.09	
Farmerville	86	58	71.6	4.08	
Franklin	93	53	71.0	6.75	
Grand Coteau	93	50	70.6	3.75	
Hammond	99	50	71.3	2.52	
Jeanerette	98	51[c]	72.4	4.95	
Jennings	96	49	71.8	3.70	
Lafayette	96	48	71.4	2.12	
Lake Charles	103	52	73.4	10.50	
Lake Providence	93	48	70.0	3.43	
L'Argent	89	47	69 2	3 10	
Lawrence	92	57	74.2	1.96	
Libertyhill	96	46	70.2	2.52	
Mansfield	95	42	68.7	1.50	
Melville	95	48	70.4	4.40	
Minden	98	45	70.1	2.24	
Monroe	95	46	70.5	4.36	
Montgomery	90	48	69 0	3.52	
New Iberia	91	52	70.9	3.85	
Opelousas	95	49	70.8	2.95	
Oxford	94	43	68.8	2.79	
Paincourtville	94	52	71.8	5.89	
Plain Dealing	94	45	68.2	3.97	
Rayne	99	46	72.4	4.86	
Robeline	95	40	66.7	3.60	
Ruston	97	47	70.6	3.20	
Schriever	99	50	72.3	4.53	
Southern University	95[c]	52[b]	71.0[c]	2.65	
Sugar Ex. Station	86	56	71.6	2.03	
Sugartown	92	52	71.2	5.24	
Venice	90	60	75.5	2 90	
Wallace	95	50	72.3	5.31	
White Sulphur Springs	98	48	73.1	4.48	
Maine.					
Bar Harbor	72	......	......	6.77	T.
Belfast *[6]	72	24	51.3	5.04	T.
Bemis	76	27	51.6	4.68	
Calais	73	19	49.0	10.87	4.0
Carmel	76	15	51.5	4.15	
Cornish *[1]	80	22	51.6	4.96	
Fairfield	75	22	51.4	4.05	
Farmington	79	16	51.8	4.23	
Flagstaff	79[e]	15[e]	49.4[e]	2.47	
Gardiner	80	21	52.4	4.47	
Lewiston	83	26	53.1	4.42	
Mayfield	76	19	49 4	2 99	
North Bridgton	83	21	53.7	4.22	
Orono	76	19	51.4	5.70	T.
Rumford Falls	79	19	51.2	3.91	T.
Winslow	78	15	53.3	4.86	
Maryland.					
Annapolis	86	39	62.5	2.35	
Bachmans Valley	85	27	58.0	2.37	
Boettcherville	89[c]	27[c]	60.4[c]	1.86	
Boonsboro *a*	89	31	60.7	1.95	
Charlotte Hall	90[c]	30[c]	63.2[c]	2.62	
Chase	85	29	60.6	2 73	
Chestertown	83	34	60.8	1.82	
Chewsville	88	29	60 3	1 37	
Clearspring	85	32	60.0	1.38	
Coleman	......	......	......	2 01	
Collegepark	90	29	61.1	1.62	
Cumberland *a*	87	36	64.0	1.89	
Cumberland *b*	......	......	......	1.59	
Darlington	85[d]	30[d]	61.8[d]	1.56	
Maryland—Cont'd.	°	°	°	*Ins.*	*Ins.*
Deerpark	82	20	53.2	2.26	
Easton	88	33	61.8	4. 5	
Ellicott City	80	......	......	1.79	
Fallston	85	31	60.6	2.47	
Frederick	86	33	61.7	2.40	
Frostburg	......	28	......	1.88	
Grantsville	88	26	56.0	1.92	
Greatfalls	85	32	60.0	1.34	
Greenspring Furnace	85	28	59.5	1.44	
Hagerstown	90	31	61.6	2.73	
Hancock	91	25	60.6	2.41	
Jewell	82	36	62.0	2.53	
Johns Hopkins Hospital	85	34	61.4	1.85	
Laurel	90	30	61.0	2.73	
McDonogh	89	29	59.3	1.68	
Mount St. Marys Coll	86	34[h]	60.3[d]	3.00	
Newmarket	87	30	60.4	2.74	
Pocomoke	84	37	63.6	1.24	
Princess Anne	87	30	61.8	2.00	
Queenstown	86	33	62.0	1.47	
Rockhall *b*	84	32	62.2	1.49	
Smithsburg *a*	89	28	60.0	1.56	
Smithsburg *b*	87	31	60.6	1.90	
Solomons	87	41	65.3	3.43	
Sudlersville	85	34	61.8	2.01	
Sunnyside	87	21	55.8	3.24	
Takoma Park	87	34	60.2	1.86	
Taneytown	87	30	61.1	1.82	
Van Bibber	82	34	59.5	1.93	
Westernport	85	28	56.6	2.02	
Westminster	88	30	60.6	1.47	
Woodstock	81	31	60.7	1.10	
Massachusetts.					
Amherst	78	23	55.2	3.37	
Bedford	78	26	54.5	3.38	
Bluehill (summit)	80	27	54.8	4.06	
Cambridge	81	28	56.8	3.71	
Chestnuthill	82	30	56.8	3.79	
Cohasset	......	......	......	4.71	
East Templeton *[1]	78	28	51.9	3.43	
Fallriver	78	31	57.8	4.92	
Fiskdale	......	......	......	4.13	
Fitchburg *a* *[1]	78	27	52.9	4.05	
Fitchburg *b*	82	24	54 2	3.58	
Framingham	82	30	55.4	3.78	
Groton	81	22	53.6	3.34	
Hyannis *[1]	74	31	55.4	4.31	
Jefferson	......	......	......	3.35	
Lawrence	83	26	55.2	2.73	
Leeds	80	20	54.0	3.46	
Leominster	......	......	......	3.44	
Longplain	......	......	......	5.90	
Lowell *a*	83	27	55.2	3.33	
Lowell *b*	79	30	54.6	......	
Ludlow Center	78	18	52.1	4.33	
Middleboro	80	24	54.9	4.68	
Monson	78	23	55.1	4.01	
New Bedford *a*	76	30	57.0	6.58	
Pittsfield	80	24	53.8	2 52	
Plymouth *[1]	75	34	56.6	4.84	
Princeton	......	......	......	3.40	
Provincetown	78	38	58.0	4.02	
Somerset *[1]	82	26	58.3	4.54	
South Clinton	......	......	......	1.87	
Springfield Armory	85	22	55.6	3.60	
Sterling	......	......	......	2.98	
Taunton *c*	77	23	54 6	3.97	
Westboro	80	21	56.0	3.99	
Weston	78	27	54.6	3.71	
Williamstown *[1]	79	25	53.0	3.52	
Winchendon	......	......	......	3.64	
Michigan.					
Adrian	86	27	57.4	2.83	
Agricultural College	87	24	56.6	2.77	
Allegan	86	28	59.0	1.76	
Alma	86	24	56.8	2.81	
Ann Arbor	89	26	58.8	2.23	
Annpere	87	......	......	2.20	
Arbela	88	28	56.8	4.20	
Baldwin	82	19	57.0	3.83	
Ball Mountain	87	27	57.6	4.25	
Baraga *	80	28	53.0	......	
Battlecreek	89	28	58.5	2.55	
Bay City	87	29	57.6	3.57	
Berlin	86	25	56.0	2.27	
Berrien Springs	88	28	59.8	1.98	
Big Point Sable *[10]	70	36	57.7	......	
Big Rapids	83	21	55.0	3.78	
Birmingham	87	30	55.2	2.71	
Boon	80	20	52 0	3.39	
Calumet	73	35	53.6	2.12	
Carsonville	86	27	59.8	2.13	
Charlevoix	82	39	57.2	1.87	
Chatham	78	24	53.8	1.94	
Cheboygan	85[e]	29[e]	56.8[e]	3.48	
Clinton	89	25	59.2	2.06	

TABLE II.—*Climatological record of voluntary and other cooperating observers.*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Michigan—Cont'd.					
Coldwater	88	26	59.2	2.46	
Deerpark	78	31	55.1	2.32	
Detour	73	33	54.8	1.91	
Dundee	88	28	57.9	2.55	
Eagle Harbor	76	35	56.2	1.48	
East Tawas	84	27	56.4	3.22	
Eloise	89	28	58.8	3.26	
Ewen	......	......	......	1.70	
Fairview	86	21	55.8	2.50	
Fitchburg	88	24	56.6	5.02	
Flint	87	24	56.3	2.95	
Gaylord	79	21	54.5	4.06	T.
Gladwin	83	23	55.9	2.20	
Grand Marais [4]	79	34	57.6	......	
Grand Rapids	86	30	59.2	2.27	
Grape	89[d]	29[d]	60.5[d]	2.37	
Grayling	80	22	52.7	2.35	
Hanover	88	25	58.4	2.98	
Harbor Beach	88	28	56.5	2.15	
Harrison	81	25	54.8	3.23	
Harrisville	79	28	56.7	2.90	
Hart	82	26	57.2	1.76	
Hastings	88	25	57.8	3.59	
Hayes	86	30	56.2	4.44	
Highland Station	......	......	......	3.82	
Hillsdale	86	25	57.6	2.99	
Humboldt	78	31[c]	50.2	3.08	T.
Ionia	88	20	57.8	1.50	
Iron River	77	21	51.8	4.25	
Ishpeming	79	29	54.7	2.68	
Ivan	81	24	55.3	1.98	
Jackson	88	27	58.7	3.65	
Jeddo	86	33	58.2	2.01	
Kalamazoo	88[e]	36[e]	59.6[e]	3.17	
Lake City	72	24	51.2	1.10	
Lansing	87	28	57.6	3.51	
Lathrop	74	26	51.4	3.37	
Lincoln	81	26	55.5	2.95	
Ludington	78	34	59.3	2.61	
Mackinac Island	78	37	55.7	2.05	
Mackinaw	83	31	56.6	2.28	
Madison	86	28	58.5	2.64	
Mancelona	81	24	56.2	4.01	
Manistee	83	27	57.2	1.50	
Manistique	68	30	55.0	2.06	
Menominee	86	29	59.1	5.12	
Middle Island *[10]	75	39	56.8	......	
Midland	87	25[b]	57.2[d]	2.10	
Mottville	88	26	57.3	2.70	
Mount Clemens [1]	89	28	61.4	......	
Mount Pleasant	86	21	55.6	2.77	
Muskegon	82	32	58.0	2.80	
Newberry	75[e]	20[e]	51.0[e]	0.52	
Northport	80	34	56.1	3.55	
Old Mission	83	34	58.1	3.73	
Olivet	84	29	57.6	3.84	
Omer	84	......	......	1.70	
Ontonagon	80	31	54.5	2.54	
Ovid	90	23	58.2	2.66	
Owosso	90	29	59.3	3.95	
Petoskey	79	31	56.5	2.56	
Plymouth	87	32	59.6	3.71	
Port Austin	88	32	59.4	3.10	
Powers	80	24	51.5	3.90	
Reed City	82	28	57.3	3.98	
Roscommon	83	25	56.0	2.25	
Saginaw	88	27	58.2	3.62	
St. Ignace	82	29	51.7	2.10	
St. Johns	87	29	57.9	3.49	
St. Joseph	75	32	55.8	2.97	
Sidnaw	80	30	55.8	2.21	
Somerset	87	26	58.0	2.98	
South Haven	85	33	59.1	2.33	
Stanton	84	24	58.7	3.53	
Thomaston	77	26	54.7	2.22	
Thornville	85	30	57.9	3.24	
Traverse City	85	31	58.2	3.46	
Vassar	88	21	55.2	2.51	
Wasepi	85	28	58.2	2.76	
Waverly	85	22	56.5	1.30	
Westbranch	83	24	54.6	2.53	
Wetmore	76	22	53.0	1.59	
Whitecloud	84	32	56.7	2.50	
Whitefish Point	73	31	54.2	2.20	
Ypsilanti	85	26	56.6	3.02	
Minnesota.					
Ada	80	23	50.5	3.08	
Albert Lea	80	30	56.8	3.66	
Alexandria	78	27	55.4	2.39	
Ashby	77	29	54.6	1.21	
Beardsley	87	......	......	1.25	
Bemidji	73	31	53.1	4.57	
Bird Island	81	24	56.6	1.64	
Blooming Prairie	80	29	56.0	3.75	
Brainerd	77	28	55.6	1.98	
Caledonia	84	30	56.0	9.16	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Minnesota—Cont'd.					
Collegeville	75	33	56.4	2.90	
Crookston	73	30	51.1	4.95	
Currie [1]	82	26	55.0	......	
Deephaven	......	......	......	6.92	
Detroit City	77	25[i]	51.0[f]	2.82	
Faribault	80	29	57.4	6.26	
Farmington	80	30	56.4	7.41	
Fergus Falls	77	30	54.0	1.58	
Glencoe	79	26	55.2	4.46	
Grand Marais	......	......		4.98	
Grand Meadow	82	27	56.2	7.29	
Hallock	73	26	48.2	2.55	
Lake Jennie	86	30	58.2	2.66	
Lakeside	80	28	56.2	2.34	
Lake Winnibigoshish	76	29	52.8	3.27	
Leech [1]	78	30*	50.2	2.99	
Leroy	..	31	......	6.82	
Long Prairie	79	25	54.9	1.64	
Luverne	80	29	56.0	1.79	
Lynd	82	26	57.9	3.04	
Mapleplain	78	31	57.3	7.26	
Milaca	78	29	55.0	0.71	
Milan	84	25	55.7	1.44	
Minneapolis *a*	79	31	56.1	4.81	
Minneapolis *b* [1]	79*	30	57.1	4.30	
Morris	80	30	55.8	1.11	
Mount Iron	75	21	51.3	3.50	
Newfolden	73	17	47.4	5.55	
New London	82	26	57.0	1.80	
New Richland *[1]	76	34	56.2	......	
New Ulm	83	30	57.9	1.67	
Park Rapids	75	29	52.9	2.99	
Pine River	76	30	54.4	2.50	
Pipestone	80	32	55.0	1.83	
Pleasant Mounds	82	32	58.3	3.00	
Pokegama Falls	78	22	51.8	4.20	
Redwing	......	......	......	3.21	
Reeds	......	......	......	9.37	
Rolling Green	80	34	56.9	2.41	
St. Charles	82	31	56.4	11.35	
St. Cloud	80	32	58.2	2.39	
St. Peter	82	29	58.4	3.20	
Sandy Lake Dam	75	28	55.6	2.56	
Shakopee	79	30	57.8	6.96	
Tower	75	......	......	0.67	
Two Harbors	72	28	50.2	3.36	
Wabasha *[1]	78	35	56.3	9.81	
White Bear	......	......	......	4.89	
Willmar	80	27	55.6	2.92	
Willow River	81	27	55.4	2.06	
Winnebago City	82	29	57.0	4.23	
Worthington	81	36	57.2	1.77	
Zumbrota [1]	76*	29	56.9	......	
Mississippi.					
Aberdeen	85	45	64.2	7.58	
Agricultural College	93	46	69.4	8.06	
Austin	88	42	66.8	2.58	
Batesville	85	45	65.9	5.98	
Bay St. Louis	91	54	72.8	2.35	
Biloxi	92	55	74.4	3.38	
Booneville	85	46	66.2	10.01	
Brookhaven	97	38	69.0	2.60	
Canton	91	46	69.6	6.14	
Columbus *a*	......	......	......	5.25	
Columbus *b*	88	48	63.4	5.26	
Corinth	87	45	65.6	8.51	
Crystalsprings	93	45	69.8	5.22	
Edwards	91	47	70.0	4.90	
Fayette	93	47	68.6	3.40	
Fayette (near) *[1]	91	52	70.3	5.33	
Greenville *a*	87	51	67.8	4.88	
Greenville *b*	90	50	68.6	5.03	
Greenwood	86	50	68.6	......	
Hazlehurst	96	46	70.9	5.08	
Hernando	87	44	66.3	3.70	
Holly Springs	88	47	66.5	7.54	
Jackson	94	40	65.9	2.46	
Kosciusko	......	......	......	6.40	
Lake	90	43	65.5	3.50	
Latonia	95[e]	53[e]	73.0[e]	4.31	
Leakesville	96	50	71.6	3.60	
Logtown	95	52	72.2	3.10	
Louisville	91	45	67.4	5.60	
Macon	90	46	67.6	4.67	
Magnolia	95	48	70.8	4.92	
Natchez	95	50	71.6	2.75	
Okolona	89	41	66.6	5.33	
Palo Alto	87	45	68.8	10.38	
Pontotoc	87	43	67.0	6.54	
Port Gibson	96	47	70.2	6.24	
Ripley	86	46	66.4	9.38	
Shoccoe	88	50	69.6	2.43	
Stonington *[1]	90	52	69.6	......	
Thornton	......	......	......	6.66	
Tupelo	......	......	......	7.26	
Walnutgrove	91[d]	46[d]	69.4[d]	4.68	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Mississippi—Cont'd.					
Watervalley	......	......	......	12.23	
Waynesboro	90	51	69.8	6.78	
Woodville	94	49	70.3	6.10	
Yazoo City	92	41	68.8	4.05	
Missouri.					
Appleton City	90	40	64.2	2.79	
Arthur *[5]	......	37	59.3	2.27	
Avalon	87	36	62.6	7.96	
Bethany	87	29	60.0	5.64	
Birchtree	84	34	61.6	2.38	
Boonville	......	......	......	4.32	
Brunswick	84	39	61.4	6.82	
Carrollton	89	39	62.6	5.57	
Conception	82	39	61.2	6.58	
Cook Station	90	28	60.6	3.40	
Cowgill *[5]	86	34	64.9	3.91	
Darksville	84	34[d]	61.0	3.75	
Downing	......	......	......	5.57	
East Lynne *[5]	......	39	58.8	2.80	
Edgehill *[5]	82	30	58.8	2.67	
Edwards	89	34	63.6	3.67	
Eldon	88	31	61.9	4.09	
Elmira	89	31	61.3	5.10	
Fairport	......	......	......	5.52	
Fayette	89	34	62.8	6.14	
Fulton	86	30	61.0	5.65	
Galena	......	......	......	3.32	
Gallatin *[1]	88	36	63.0	6.12	
Gayoso	85	38	64.4	2.79	
Glasgow	88	36	62.4	3.76	
Gorin	......	......	......	4.66	
Halfway	88	32	62.6	3.55	
Harrisonville	89	34	61.6	2.33	
Hazlehurst	......	......	......	4.92	
Hermann	......	......	......	3.67	
Houston	86	30	60.2	3.97	
Houstonia (near)	......	......	......	4.65	
Irena	......	......	......	6.40	
Ironton	90	25	60.8	2.58	
Jackson *[5]	86	35	58.8	2.73	
Jefferson City	......	......	......	2.27	
Kidder	87	33	62.1	5.13	
Koshkonong	87	40	64.5	8.16	
Lamar	91	36	63.9	2.30	
Lamonte	......	......	......	4.39	
Lebanon	86	34	62.6	4.00	
Lexington	89	33	63.6	4.87	
Liberty	89	33	62.3	2.87	
Louisiana	92	32	62.7	4.08	
McCune *[1]	89	36	63.0	4.33	
Macon	89	35	63.0	4.39	
Marblehill	86[f]	35[f]	61.8[f]	1.67	
Marshall	86	34	60.6	6.01	
Maryville	87	33	59.8	4.79	
Mexico	91	33	63.1	7.83	
Miami *[5]	86	39	62.5	8.38	
Mineralspring	83	32	59.9	4.04	
Montreal	86	33	61.5	3.43	
Mount Vernon	90	36	66.2	3.46	
Neosho	88	33	62.6	3.99	
Nevada	......	......	......	1.33	
New Haven	90	36	63.2	3.93	
New Madrid	85[j]	41[j]	65.8[j]	3.06	
New Palestine	88	35	63.2	4.63	
Oakfield	89	35	64.2	3.41	
Olden	85	37	61.9	2.81	
Oregon *a*	88	37	62.2	5.60	
Oregon *b*	89	39	65.1	5.40	
Palmyra *[5]	90	38	62.5	3.34	
Phillipsburg *[1]	85	34	59.8	3.64	
Pickering	......	......	......	5.15	
Pine Hill	......	......	......	1.85	
Poplarbluff	91	33	64.5	3.09	
Potosi	90	27	60.7	2.54	
Princeton	83	33	62.5	5.62	
Richmond	85	37	62.6	3.95	
Rockport	......	......	......	4.42	
Rolla	......	......	......	3.13	
St. Charles	88	36	63.7	2.66	
St. Joseph	......	......	......	2.44	
Sarcoxie *[4]	......	38	58.2	3.10	
Sedalia	89	34	61.4	4.46	
Seymour	85	34	61.3	5.98	
Shelbina	......	......	......	6.50	
Sikeston	89	34	63.9	2.57	
Steffenville	87	31	62.2	5.49	
Sublett	86	30	60.3	7.52	
Trenton	83	36	61.4	6.52	
Unionville	88	36	63.4	4.50	
Vichy	86	36	62.2	3.30	
Warrensburg	87	38	62.2	4.85	
Warrenton	88	33	61.5	4.36	
Wheatland	......	......	......	4.82	
Willowsprings	87	33	63.4	4.14	
Windsor	87	35	62.6	3.35	
Wylie	90	35	63.8	3.34	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
Zeitonia	91	31	65.6	2.36	
Montana.					
Augusta[d]	70	18	45.9	0.02	
Boulder	70	14	41.4	1.57	7.0
Bozeman	71	22	43.5	1.63	5.0
Butte	67	25	43.8	2.08	
Canyon Ferry	70	31	48.6	1.34	.....
Chester	83	26	54.4	0.02	T.
Clemons	73	14	45.2	......	
Columbia Falls	60	18	42.2	3.42	......
Corvallis	80	20	48.6	0.30	
Crow Agency	79	19	47.8	0.81	T.
Dell	......	15	......	1.05	10.5
Dillon	70	20	43.8	2.84	17.6
Ekalaka	77	24	49.6	0.04	T.
Fort Logan	68	23	42.6	1.18	3.0
Glasgow	79	18	47.0	0.71	
Glendive	82	23	49.3	1.10	
Glenwood	72	23	43.4	2.58	
Greatfalls	71	28	47.2	0.80	2.3
Lewistown	74	18	44.2	1.00	T.
Livingston	75	20	49.8	1.20	
Manhattan	71	20	44.4	0.79	5.0
Martinsdale	74	18	44.0	0.75	
Marysville	68	24	42.1	1.42	8.0
Missoula	71	21	45.8	0.72	T.
Parrot	69	23	44.4	1.75	2.1
Plains	72	23	45.8	0.86	
Poplar	78	21	47.8	0.91	
Ridgelawn	80	20	48.3	0.27	
St. Pauls	95	16	48.9	1.23	
Twin Bridges[d]	71	20	42.0	......	
Wibaux	75	20	46.3	1.62	T.
Nebraska.					
Agate	......	......	......	0.69	T.
Agee	......	......	......	3.95	
Albion	90[e]	25[e]	57.7[e]	3.12[e]	......
Alliance	......	......	......	0.40	
Alma	94	25	58.9	1.05	
Ansley	87	23	54.6	1.27	
Arapaho*[1]	88	32	58.8	0.30	
Arborville*[1]	90	34	56.7	6.75	
Arcadia	90	26	57.0	1.92	
Arlington	......	......	......	5.70	
Ashland *a*	89	32	61.8	4.27	
Ashland *b*	......	......	......	2.75	
Ashton	......	......	......	3.70	
Auburn	90	29	61.6	5.36	
Aurora*[1]	88	32	59.3	3.09	
Bartley	......	......	......	0.09	
Beatrice	90	26	61.2	1.06	
Beaver	98	26	60.2	0.62	
Bellevue	......	......	......	4.43	
Benedict	......	......	......	4.36	
Benkleman	......	......	......	T.	
Blair	88	35	60.5	5.21	
Bluehill	......	......	......	1.92	
Bradshaw	......	......	......	5.51	
Brokenbow*[1]	80	28	53.6	1.10	
Burchard	......	......	......	0.83	
Burwell	......	......	......	1.96	
Callaway	......	......	......	1.25	
Camp Clarke	86	20	49.0	0.58	
Central City	......	......	......	5.65	
Chester	......	......	......	3.42	
Columbus	85	29	58.6	3.99	
Crete	86	33	60.8	2.15	
Culbertson	......	......	......	0.49	
Curtis	81	26	54.0	T.	
David City	83	31	58.8	3.65	
Dawson	91	32	63.8	6.45	
Eden	......	......	......	7.55	
Edgar *a*	......	......	......	2.46	
Ericson	......	......	......	2.07	
Ewing	......	......	......	2.85	
Fairbury	91	26	60.1	1.78	
Fairfield	92	31	60.6	2.88	
Fairmont	89	30	59.1	3.10	
Fort Robinson	85	23	51.7	1.50	T.
Franklin	92	28	58.5	2.14	
Fremont	88	27	59.4	5.47	
Geneva	89	28	59.9	1.90	
Genoa	88	31	58.6	4.76	
Gering	83	22	50.0	1.01	T.
Gosper	......	......	......	1.00	
Gothenburg	92	20	54.4	0.35	
Grand Island *a**[1]	88	40	58.5	5.46	
Grand Island *b*	90	32	59.1	5.88	
Greeley	......	......	......	2.25	
Guide Rock	87	30	60.4	2.17	
Haigler	......	......	......	T.	
Hartington	86	33	56.7	1.80	
Harvard	88	30	58.2	3.34	
Hastings*[1]	86	36	56.9	2.18	
Hay Springs	82	23	50.9	1.22	T.
Hebron	89	28	61.1	2.87	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Hickman	......	......	......	0.80	
Holdrege	......	......	......	3.30	
Hooper*[1]	87	30	57.4	5.74	
Imperial	90	22	54.2	T.	
Johnstown	......	......	......	T.	
Kearney	......	......	......	3.70	
Kennedy	87	19	53.3	0.87	
Kimball	78	17	50.1	0.14	
Kirkwood*[1]	87	30	53.7	3.93	
Laclede	88	30	57.6	5.29	
Lexington	91	24	55.2	0.65	
Lodgepole	85	17	51.7	T.	
Loup	88	28	56.4	2.57	
Lyons	......	......	......	2.58	
McCook*[1]	83	25	57.2	0.41	
McCool	......	......	......	2.44	
Madison	85	30	58.0	5.39	
Madrid	......	......	......	0.10	
Marquette	......	......	......	6.63	
Mason City	......	......	......	1.75	
Minden *a*	92	31	58.3	3.41	
Monroe	......	......	......	4.04	
Nebraska City *b**[1]	88	40	60.3	4.50	
Nebraska City *c*	88	34	60.6	......	
Nemaha*[1]	98	32	56.2	5.41	
Nesbit	86	22	52.4	0.32	
Norfolk	87	28	57.4	3.26	
North Loup	93	25	56.8	2.36	
Oakdale	89	31	56.2	2.88	
Odell	......	......	......	1.86	
O'Neill	89	22	54.4	3.21	
Ord	......	......	......	2.65	
Osceola	......	......	......	4.35	
Ough	......	......	......	0.00	
Palmer*[5]	86	36	58.9	2.58	
Palmyra*[1]	90	34	59.4	2.44	
Plattsmouth *b*	......	......	......	3.29	
Pleasanthill	......	......	......	1.92	
Ravenna *a*	90	28	57.7	3.17	
Ravenna *b*	......	......	......	3.21	
Redcloud *a**[1]	88	27	57.0	1.86	
Republican*[1]	88	32	56.2	1.79	
St. Libory	......	......	......	3.47	
St. Paul	92	22	57.2	2.82	
Salem*[1]	88	36	59.8	5.47	
Santee	90	32	58.8	3.15	
Sargent	......	......	......	2.20	
Schuyler	......	......	......	3.39	
Seneca*[1]	84	27	54.8	T.	
Seward	82	45	62.8	1.91	
Smithfield	......	......	......	2.62	
Spragg	......	......	......	2.76	
Springview	84	25	54.0	0.85	
Stanton*[1]	84	31	56.5	3.76	
State Farm	90	26	61.7	2.66	
Strang	90	32	62.4	2.25	
Stratton	......	......	......	0.10	
Superior*[5]	86	32	61.2	2.50	
Syracuse	......	......	......	3.25	
Tablerock	......	......	......	5.80	
Tecumseh *b*	90	29	63.3	2.43	
Tecumseh *c*	......	......	......	3.21	
Tekamah	88	28	60.6	2.20	
Turlington	90	35	60.6	4.83	
Valparaiso	......	......	......	2.10	
Wakefield	88	27	57.9	2.80	
Wallace	......	......	......	0.00	
Wauneta	......	......	......	0.00	
Weeping Water*[1]	85	24	56.2	2.10	
Westpoint	85	32	59.9	3.80	
Whitman	......	......	......	0.00	
Wilber*[1]	90	30	59.1	1.65	
Willard	......	......	......	0.30	
Wilsonville	87	30	58.5	0.26	
Winnebago	......	......	......	3.50	
Wisner	......	......	......	3.03	
Wymore	......	......	......	2.23	
York	......	......	......	2.77	
Nevada.					
Austin	66	15	46.4	1.03	
Battle Mountain*[1]	76	20	48.1	......	
Belmont	65	14	45.4	0.52	
Candelaria	82	16	53.4	0.20	
Carlin*[1]	75	15	43.6	0.30	3.0
Carson City	79	16	49.6	1.20	
Clover Valley	72[g]	14[g]	43.4[g]	1.93	3.0
Cranes Ranch	......	......	......	0.66	
Duck Valley	73	17	44.9	1.65	3.9
Elko*[1]	70	18	39.2	0.73	2.0
Elko (near)	72	12	46.0	2.10	2.0
Ely	65	13	43.0	0.79	
Empire Ranch	65	18	43.6	0.07	0.5
Fenelon*[1]	64	20	42.4	0.90	5.0
Golconda*[1]	76	28	47.8	0.51	
Halleck*[1]	76	20	46.5	0.60	3.0
Hamilton	......	4	......	1.33	.....

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Hawthorne	72	29	52.7	......	
Hot Springs*[1]	80	32	54.8	......	
Humboldt*[1]	77	22	49.8	0.84	
Lee	......	......	......	2.18	4.5
Lewers Ranch	76	19	49.5	4.06	1.0
Lovelocks*[1]	71	25	49.1	0.23	
Martins	75	31	56.0	1.01	T.
Mill City*[1]	70	34	47.2	0.65	T.
Palisade*[1]	72	26	49.7	0.35	
Palmetto	73	4	47.0	0.80	
Reno State University	75	16	49.4	0.44	T.
Silverpeak	81	19	55.6	0.12	
Sodaville	71	16	47.2	0.90	
Tecoma*[1]	67	10	45.0	T.	T.
Toano*[1]	78	13	42.2	T.	
Tybo	68	18	47.7	1.55	
Verdi*[1]	74	28	47.9	1.10	
Wadsworth*[1]	80	12	48.9	T.	
Wells	......	......	......	1.19	4.0
New Hampshire.					
Alstead	......	......	......	3.64	
Berlin Mills	83	15	51.8	2.98	
Bethlehem	77	19	52.0	5.02	T.
Brookline*[1]	84	21	53.2	3.59	
Claremont	83	18	53.6	3.40	
Concord	81	18	54.3	2.19	
Durham	84	24	53.6	4.32	
Grafton	82	15	52.6	3.43	
Hanover	84[e]	19	53.0[e]	3.17	T.
Keene	82	19	53.1	3.15	
Littleton	78	17	50.8	4.16	
Nashua	84	23	54.7	2.76	
Newton	83	21	54.4	4.00	
North Conway	82	18	52.7	2.12	
Peterboro	79	18	52.2	3.47	
Plymouth	80	17	52.6	3.94	
Sanbornton	81	19	52.6	2.91	
Stratford	82	26	52.4	5.07	
New Jersey.					
Asbury Park	79	36	61.4	3.71	
Bayonne	83	33	60.8	3.49	
Belvidere	89	26	59.0	1.54	
Bergen Point	80	36	60.0	4.06	
Beverly	90	32	60.8	3.93	
Billingsport*[1]	80	39	60.3	4.28	
Bridgeton	90	32	62.4	6.59	
Camden	83	35	60.0	4.43	
Cape May C. H.	90	32	62.3	2.05	
Charlotteburg	84	20	55.8	2.76	
Chester	86	31	57.6	3.33	
Clayton	91	30	60.2	4.06	
College Farm	85	30	59.8	3.53	
Deckertown	89	24	58.6	1.83	
Dover	87	24	57.2	2.95	
Egg Harbor City	88	30	59.3	4.23	
Elizabeth	82	31	59.4	4.10	
Englewood	76	34	59.0	4.58	
Flemington	90	30	60.4	2.20	
Freehold	84	30	58.8	4.38	
Friesburg	91	29	61.4	4.18	
Hammonton	......	......	......	5.49	
Hightstown	84	33	59.9	3.80	
Imlaystown	87	33	61.8	6.28	
Lambertville	88	28	59.2	2.81	
Layton	92	19	57.8	1.47	
Moorestown	89	32	61.0	5.28	
Mount Pleasant	......	......	......	2.38	
Newark	84	30	59.0	4.50	
New Brunswick	88	31	60.8	4.11	
Newton	90	24	58.4	2.07	
Ocean City	85	31	59.0	2.77	
Oceanic	78[j]	37[j]	56.8[j]	4.09	
Paterson	84	32	60.4	4.43	
Perth Amboy	81	35	60.4	3.54	
Plainfield	86	28	58.7	5.25	
Rivervale	83	24	57.8	6.07	
Roseland	86	24	57.4	4.02	
Salem	91	31	63.5	......	
Somerville	87	28	59.8	2.86	
South Orange	80	30	58.0	5.09	
Toms River	88	25	58.8	4.73	
Trenton	82	36	60.7	3.29	
Tuckerton	87	30	60.2	3.75	
Vineland	92	32	61.3	4.65	
Woodbine	85	30	61.4	2.82	
New Mexico.					
Albert	87	30	59.6	1.50	T.
Albuquerque	80	28	56.8	0.25	
Alma	80	22	55.4	1.00	
Aztec	81	10	52.8	0.76	T.
Bellranch	......	......	......	1.17	
Bernalillo	80	28	56.5	0.58	
Bluewater	76	12	48.0	0.40	T.
Cambray	......	......	......	0.10	
Deming	......	......	......	0.20	
East Lasvegas	72	28	51.0	1.98	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Engle	85	22	58.8	0.64	
Espanola	79	22	53.0	0.73	
Folsom	77	23	52.4	1.66	2.5
Fort Bayard	78	24	56.2	0.49	
Fort Stanton	82[c]	26[c]	54.7[c]	1.43	
Fort Union	82	25	51.4	1.63	
Fort Wingate	84	15	53.4	0.74	
Gage				0.28	
Galisteo	77	27	53.0	1.90	
Gallinas Spring	80	28	55.2	2.01	
Horse Springs	80			1.86	
Las Vegas Hotsprings	74	19	51.2	2.99	
Lordsburg				0.12	
Los Lunas	81	25	54.2	0.40	
Lower Penasco				1.05	
Lyons Ranch	86	25	60.2	1.22	
Mesilla Park	91	29	61.8	0.45	
Olio	74	23	50.4	T.	
Raton	84	20	53.8	1.35	T.
Roswell	90	34	61.8	3.33	
San Marcial	87			0.00	
Socorro	84	28	59.0	0.60	
Springer	84	18	53.3	0.35	
Strauss				0.15	
Whiteoaks	79	27	56.0	1.56	
Winsors Ranch	69	14	43.2	2.08	T.
Woodbury	81	21	54.6	0.47	T.
New York.					
Adams				3.84	
Addison	90	25	56.6	4.80	
Akron				3.67	
Alden	86	30	61.4	3.18	
Alfred				4.58	
Angelica	85	20	54.0	4.52	
Appleton	88	25	57.9	2.97	
Atlanta	91	23	55.8	3.79	
Auburn	94	25	60.0	3.37	
Avon	89	24	57.8	4.06	
Axton	79[d]	24[d]	50.8[d]	2.05	T.
Baldwinsville	85	27	57.8	3.41	
Bedford *a*				5.50	
Beedes	77	19	50.3	1.73	
Bisby Lodge				3.39	
Blue Mountain Lake				1.90	
Bolivar	89	18	54.1	5.94	
Bouckville	82	24	54.1	3.60	
Boyds Corners				4.26	
Brockport	85	29	58.2	3.89	
Caldwell	78	25	54.8	1.86	
Canaan Four Corners	83	23	54.2	3.18	
Canajoharie	84	24	55.1	2.31	
Canton	82	21	52.6	2.84	
Carmel	82	27	58.0	3.83	
Carvers Falls	82	22	51.8	2.04	
Catskill	87	27	57.4	2.13	
Cedarhill	90	22	57.5	2.26	
Charlotte*[1b]	82	25	53.2		
Chenango Forks				3.26	
Cooperstown	79	23	53.5	2.57	
Cortland	85	26	57.9	4.59	
Cutchogue	76	28	58.4	3.00	
Dekalb Junction				2.54	
Easton				3.27	
Elba	88	22	58.2	3.39	
Elmira	86	28	58.5	4.19	
Fleming	86	28	59.0	2.43	
Franklinville	86	23	55.1	3.79	
Fulton				4.67	
Gabriels	77	19	50.0	1.72	T.
Glens Falls	80	25	54.7	1.61	
Gloversville	86	21	53.6	2.87	
Greenwich	83	24	55.6	2.31	
Griffin Corners				1.61	
Haskinville				4.07	
Hemlock	82	32	57.4	3.45	
Honeymead Brook	82	24	55.8	2.71	
Honnedaga Lake				3.99	
Hoosick Falls				1.97	
Humphrey	85	26	56.2	3.69	
Indian Lake	80	18	51.5	2.31	T.
Ithaca	87	27	57.2	4.06	
Jamestown	84	30	58.0	3.18	
Jay	82	20	52.8	1.43	
Keene Valley	82	19	52.2	1.73	T.
King Ferry				3.94	
King Station				2.60	
Lake Pleasant				1.15	
Liberty				3.80	
Littlefalls	87	25	54.6	2.42	
Lockport	85	30	57.6	2.60	
Lowville	84	20	54.1	3.60	
Lyndonville				2.03	
Lyons	85	32	58.6	3.71	
Mayle				1.82	
Meredith	78	21	52.1	2.15	T.
Middletown	88	30	57.0	2.16	
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Moira	83	23	53.2	1.90	
Newark Valley				4.22	
New Lisbon	83	17	51.2	2.87	
North Germantown				2.08	
North Hammond	80	24	55.2	3.13	T.
North Lake	81	21	52.0	3.25	
Number Four	80	19	52.6	3.00	T.
Nunda	87	27	55.8	3.78	
Ogdensburg	80	27	55.4	2.48	
Old Chatham				3.89	
Oneonta	89	22	56.3	3.07	
Oxford	85	18	54.2	3.62	
Palermo	82	22	54.1	3.32	
Penn Yan	92	27	58.8	3.62	
Perry City	85	22	55.2	4.76	
Phœnix				2.78	
Plattsburg Barracks	76	25	52.6	1.00	T.
Port Byron	85	28	56.7	3.73	
Port Jervis	88	23	56.9	1.31	
Primrose	80	27	57.0	3.93	
Red Hook				2.24	
Richmondville	78	22	53.4	2.61	
Ridgeway	86	27	58.4	2.69	
Rome	80	25	53.4	2.65	
Romulus	87	29	58.4	4.89	
Rose				4.17	
St. Johnsville	86	22	54.8	1.89	
Salisbury Mills				3.45	
Saranac Lake	79	20	50.7	1.44	T.
Saratoga Springs	83	24	55.1	2.00	
Schenectady	90	25	56.3	2.51	
Scottsville				4.29	
Setauket	77	34	58.8	2.97	
Shortsville	86	30	58.8	3.14	
Skaneateles				3.40	
South Canisteo	87	24	54.3	5.81	
Southeast Reservoir				3.98	
South Kortright	83	16	51.6	2.09	
Straits Corners	88	20	54.6	4.89	
Ticonderoga	85	31	56.4	1.65	
Volusia	85	30	57.8	3.40	
Walton	88	19	54.9	1.86	
Wappingers Falls	85	26	58.0	3.67	
Warwick				1.84	
Watertown	80	25	56.0	3.09	T.
Waverly	91	24	56.2	3.72	
Wedgwood	90	26	57.0	5.33	
West Berne	90	21	54.7	3.15	
West Chazy	76	21	51.8		
Westfield *a*	85	35	60.1	3.29	
Westfield *b*	84	32	59.4	3.03	
Westfield *c*	85	35	60.9	3.48	
Williamson				3.77	
Windham	87	18	53.2	1.78	
North Carolina.					
Abshers	86	32	63.0	8.73	
Asheville				2.92	
Biltmore	84	36	59.8	3.67	
Bryson City				2.87	
Chapelhill	89	36	65.4	1.10	
Cherryville	86	35	65.0	2.29	
Currituck				1.35	
Edenton	84[d]	38[d]	65.2[d]	1.25[d]	
Fayetteville	90	31	66.8	1.26	
Flatrock	78[d]	33[d]	57.5[d]	8.17[d]	
Goldsboro	87	37	65.4	1.06	
Greensboro	85	39	63.4	3.21	
Henderson	89	37	64.8	0.88	
Hendersonville	84	38	62.6	4.10	
Henrietta	85	39	64.8	4.15	
Highlands	75	38	56.2	6.00	
Horse Cove	75	43	60.4	8.63	
Kinston	90	33	66.6	1.54	
Linville	71[g]	30[g]	54.3[g]	13.40	
Littleton	90	31	62.5	1.64	
Louisburg	89	33	64.8	1.58	
Lumberton	85	38	66.0	3.32	
Marion	86	38	63.3	9.69	
Marshall	85	35	61.2	3.51	
Mocksville	87	32	64.4	3.04	
Moncure	85	33	64.6	1.35	
Monroe	90	29	64.2	2.78	
Morganton	86	34	62.1	3.20	
Mountairy	84	32	61.9	4.04	
Murphy				5.19	
Newbern	90	40	68.1	5.17	
Oakridge	87	36	63.6	3.26	
Patterson*[1]	80	32	58.9	9.83	
Pittsboro	88	32	64.6	1.64	
Rockingham	88	38	61.0	0.77	
Roxboro	87	36	63.4	2.68	
Salem	84	34	62.8	3.12	
Salisbury	89	34	64.8	1.90	
Saxon	90	33	64.4	3.60	
Selma	90	29	66.7	0.47	
Settle	92	37	64.6	2.99	
North Carolina—Cont'd	°	°	°	*Ins.*	*Ins.*
Sloan	90	34	67.2	3.07	
Soapstone Mount	88	30	63.4	3.43	
Southern Pines *a*	92	36	67.8	1.02	
Southern Pines *b*	87	42	67.0	0.99	
Southport	89	49	70.1	4.10	
Springhope*[1]	87	34	65.1		
Tarboro	94	36	67.4	1.06	
Waynesville	81	35	58.4	2.12	
Weldon *a*	86	35	63.8	1.25	
Weldon *b*				1.22	
North Dakota.					
Amenia	78[e]	24[e]	49.2[e]	3.03	
Ashley	79	16	49.0	1.11	
Berlin	78	18	47.5	1.02	
Buxton	73	24	48.4	2.66	
Churchs Ferry	76	22	48.0	0.75	
Coalharbor	77	24	46.8	0.90	
Devils Lake	73	23	50.0	2.60	
Dickinson	78	22	47.0	0.47	
Donnybrook				1.57	
Dunseith	87	19	47.0	0.87	
Ellendale	77	24	51.5	1.10	
Falconer	78	24	48.9	1.74	
Fargo	81	22	49.7	2.80	
Fort Berthold	83[g]	22[g]	49.0[g]	1.29	
Fort Yates	82	22	49.2	1.17	
Fullerton	77	21	48.8	1.84	
Gallatin	71	16	46.4[e]	1.88	
Glenullin	77	23	48.0	1.06	
Grafton	74	25	47.5	1.10	
Hamilton	75	26	47.2	1.27	
Hannaford	75	20	48.6	1.38	
Jamestown	78	21	46.9	1.42	
Larimore	76	22	47.4	1.77	
McKinney	78	20	44.8	1.96	
Mayville	76	28	49.6	3.00	
Medora	80	14	48.6	0.30	
Melville	73	21	48.4	1.34	
Milton	68	23	45.8	0.80	
Minnewaukon	74	21	47.2	0.72	
Minto	75	23	47.6	1.95	
Napoleon	78	19	48.1	0.76	
New England	76	17	46.0		
Oakdale	79			0.87	
Pembina	74	24	47.0	2.94	
Portal	70	23	45.6	1.60	1.5
Power	80	27	50.6	1.94	
Steele	75	19	48.8	0.71	
Towner	75	21	47.4		
University	73	26	46.9	2.81	
Wahpeton	80	23	51.8	2.28	
Willow City	76	21	47.2	1.03	
Woodbridge	72	21	45.3	0.26	T.
Ohio.					
Akron	86	32	59.6	1.38	
Annapolis	90[h]	35[h]	63.8[h]	1.08[h]	
Ashland	85	32	61.1	1.62	
Ashtabula	88	33	60.0	1.50	
Atwater				1.99	
Bangorville	87	34	60.8	1.74	
Bellefontaine	80	25	60.4	2.78	
Bement	86	32	57.0	1.21	
Benton Ridge	88	29	59.0	3.05	
Bethany	90	33	62.6	1.97	
Bigprairie	87	31	60.0	1.28	
Binola				2.14	
Bladensburg	86	30	58.8	1.10	
Bloomingburg	85	33	61.8	1.57	
Bowling Green	87	28	59.8	2.95	
Bucyrus	90	30	59.4	1.75	
Cambridge	85			1.64	
Camp Dennison	89	31	62.0	1.72	
Canal Dover	86	26	57.8	1.35	
Canton	86	31	59.4	1.35	
Cardington	91	29	59.4	2.42	
Cedarville				2.01	
Celina	88	27	60.6	1.87	
Circleville	90	30	62.0	1.70	
Clarksville	89	32	63.3	1.67	
Cleveland *a*	84	36	60.3	2.51	
Cleveland *b*	85	38	61.2	2.02	
Coalton	90	24	62.0	1.22	
Colebrook	88	28	56.5	2.19	
Dayton *a*				2.82	
Dayton *b*	93	29	63.0	3.35	
Defiance	89	26	60.1	3.07	
Delaware	88	27	59.6	1.27	
Demos	86	31	59.2	1.43	
Elyria	87	31	60.5	1.09	
Findlay	91	33	61.8	3.16	
Frankfort	87	28	60.2	1.35	
Garrettsville	89	23	57.6	1.94	
Granville	88	28	58.3	2.15	
Gratiot	86	27	59.2	1.41	
Green	89	30	63.7	1.05	
Greenfield	83	34	61.3	1.15	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Greenhill	88	25	57.7	1.51	
Greenville	83	34	60.1	2.03	
Hanging Rock	90	32	64.2	1.25	
Hedges	87	24	59.4	2.78	
Hillhouse	89	28	59.2	2.58	
Hillsboro	87	26	59.8	1.75	
Hiram	85	32	59.2	1.99	
Hudson	90	29	58.7	2.29	
Jacksonboro	90	35	64.0	2.05	
Kenton	90	31	62.3	3.67	
Killbuck	85	30	59.4	1.86	
Lancaster	88	29	60.8	1.36	
Leipsic	89	26	58.5	1.55	
McConnelsville	90	27	61.4	1.55	
Mansfield	.....	.....	.....	2.15	
Marietta	87	35	62.3	1.27	
Marion	91	32	61.6	1.84	
Medina	92	30	60.6	2.83	
Milfordton	86	31	59.2	1.62	
Milligan	90	25	60.2	1.17	
Millport	88[e]	24	56.6[e]	1.46	
Montpelier	86	27	57.8	3.62	
Napoleon	91	29	61.0	2.62	
Neapolis	.....	.....	.....	2.80	
New Alexandria	86	33	60.5	1.31	
New Berlin	88	28	59.4	1.86	
New Bremen	87	28	60.7	2.19	
New Holland	88	30	61.3	1.33	
New Paris	88	28	61.5	1.57	
New Richmond	90	33	64.5	2.24	
New Waterford	85	27	57.4	2.11	
North Lewisburg	88	31	59.7	1.85	
North Royalton	89	34	61.2	2.50	
Norwalk	90	32	60.2	1.39	
Oberlin	88	32	59.4	1.00	
Ohio State University	86	28	60.4	2.11	
Orangeville	86	25	57.1	1.40	
Ottawa	90	28	61.2	2.03	
Pataskala	88	27	60.6	1.98	
Perry	.....	.....	.....	2.11	
Philo	90	31	60.8	1.00	
Plattsburg	86	30	60.8	2.33	
Pomeroy	88	32	61.6	1.51	
Portsmouth *a*	.....	.....	.....	1.60	
Portsmouth *b*	87	34	63.4	1.60	
Pulse	.....	.....	.....	2.03	
Richwood	91	27	60.7	1.87	
Ripley	88	30	63.3	1.01	
Rittman	85	30	58.6	2.40	
Rockyridge	91	33	61.0	1.77	
Rosewood	87	29	60.5	3.01	
Shenandoah	88	31	59.5	0.83	
Sidney	89	30	60.4	5.21	
Sinking Spring	87	31	63.4	1.10	
Somerset*	89	34	62.4	1.18	
Springboro	.....	.....	.....	3.69	
Springfield	.....	.....	.....	1.64	
Strongsville	.....	.....	.....	2.22	
Thurman	93	27	64.0	1.25	
Tiffin	85	37	60.2	1.91	
Upper Sandusky	88	33	60.2	2.62	
Urbana	82	32	59.4	1.99	
Vanwert	86	28	59.9	2.12	
Vermillion	88	32	59.6	1.28	
Vickery	91	34	60.6	1.46	
Walnut	.....	.....	.....	1.80	
Warren	89	24	59.2	1.72	
Warsaw	88	24	57.8	1.51	
Wauseon	92	25	60.2	3.09	
Waverly	90	28	63.0	1.44	
Waynesville	90	31	60.9	2.16	
Wellington	86	32	59.4	0.94	
Westerville	83[d]	35[d]	61.1[d]	2.24	
Wooster	86	30	58.9	2.10	
Youngstown	.....	.....	.....	1.51	
Zanesville	.....	.....	.....	1.09	
Oklahoma.					
Arapaho	91	37	63.6	2.62	
Beaver	92	34	61.0	1.33	
Blackburn	88	34	62.4	2.61	
Burnett	90	35	64.8	4.93	
Clifton	91	33	65.8	3.40	
Fort Reno	89	39	64.2	1.60	
Fort Sill	90	37	63.4	3.40	
Hennessey	92	38	65.0	2.79	
Jefferson	94	34	62.6	2.62	
Jenkins	90	33	62.6	1.46	
Kingfisher	91	37	65.3	4.12	
Norman	88	36	63.6	4.35	
Prudence	92	33	64.7	3.73	
Sac and Fox Agency	89	35	63.5	3.81	
Stillwater	88	39	65.2	2.87	
Taloga	95	47	68.6	1.48	
Vittum	86	42	65.1	3.08	
Waukomis	91	38	64.6	1.87	
Wood	.....	.....	.....	2.90	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oklahoma—Cont'd.	°	°	°	*Ins.*	*Ins.*
Woodward	90	35	63.6	0.97	
Oregon.					
Albany *a* *[1]	79	36	55.3	4.00	
Albany *b*	.....	.....	.....	5.10	
Alpha	78	34	52.4	13.64	
Arlington	76	32	53.4	1.29	
Ashland *b*	79	32	51.2	3.64	
Aurora *[1]	80	36	51.0	4.01	
Aurora (near)	72	33	50.6	4.92	
Bay City	65	35	51.4	14.45	
Brownsville *[1]	76	38	54.4	3.45	
Bullrun	64	36	48.8	10.69	
Burns	75	18	43.1	0.62	2.5
Cascade Locks	74	40	52.8	12.84	
Comstock *[1]	75	36	51.6	7.12	
Coquille	.....	.....	.....	7.62	
Corvallis	76[d]	35[d]	52.6[d]	5.88	
Dayville	82	27	49.7	2.76	
Ella	.....	.....	.....	1.71	
Eugene	72	36	52.0	4.87	
Fairview	65	40	51.1	8.02	
Falls City	68	32	49.4	11.44	
Forest Grove	75	32	49.8	6.01	
Gardiner	70	40	53.0	9.74	
Glenora	76	33	49.7	18.54	
Government Camp	78	27	43.2	11.98	
Grants Pass	79	32	51.6	5.45	
Hare	76	36	50.9	12.14	
Hood River (near)	78	31	51.2	4.59	
Jacksonville	82	32	51.1	4.73	
Joseph	73	17	42.2	1.53	2.5
Junction City *[1]	72	40	50.8	3.82	
Kerby	78	31	51.2	11.53	
Klamath Falls	70	25	45.4	.....	
Lafayette *[1]	76	36	51.4	5.59	
Lagrande	74	25	47.6	2.24	T.
Lonerock	77	19	42.8	2.78	
McMinnville	76[c]	23[c]	50.5	6.94	
Merlin *[1]	75	36	51.4	6.32	
Monmouth *a* *[1]	70	36	50.4	4.42	
Monroe	74	33	51.8	5.92	
Mount Angel	71	36	51.4	5.90	
Nehalem	.....	.....	.....	14.90	
Newberg	75	32	53.6	5.45	
Newbridge [f]	70	15	43.7	1.19	
Newport	68	38	51.8	9.07	
Pendleton	81	29	52.7	3.92	
Placer	.....	.....	.....	7.47	
Prineville	87	20	52.1	1.90	
Riddles *[1]	86	36	51.6	4.16	
Salem *b*	81	31	55.8	4.70	
Sheridan *[1]	68	36	50.0	7.18	
Silverlake	80	15	43.6	2.09	T.
Silverton *[1]	72	38	52.0	4.77	
Siskiyou *[1]	70	26	44.2	2.34	.....
Sparta	69	23	42.4	2.76	8.0
Springfield *[1]	70	36	51.1	4.68	
Stafford	75	34	51.5	5.81	
The Dalles	75	31	51.4	2.02	
Tillamook	.....	.....	.....	4.77	
Toledo	79	33	51.9	7.73	
Umatilla	.....	.....	.....	1.67	
Vale	75	14	45.8	1.30	
Westfork *[1]	64	34	45.1	6.30	
Weston	75	26	48.2	5.62	T.
Williams	76	28	50.0	5.67	
Pennsylvania.					
Altoona	84	25	57.3	3.63	
Athens	93	23	58.1	3.10	
Beaver Dam	.....	.....	.....	1.87	
Bellefonte	91	28	59.0	3.95	
Brookville	.....	.....	.....	3.33	
Browers Lock	.....	.....	.....	2.17	
Butler	86	27	56.8	2.53	
Carlisle	86	29	59.6	2.74	
Cassandra	83	27	54.8	2.99	
Chambersburg	88	27	58.8	2.03	
Coatesville	94	27	61.2	1.45	
Confluence	90	27	58.4	3.08	
Coopersburg	84	30	60.0	2.20	
Davis Island Dam	.....	.....	.....	1.72	
Derry Station	92	31	61.2	3.56	
Driftwood	.....	.....	.....	4.08	
Duncannon	.....	.....	.....	3.13	
Dushore	84	19	54.2	2.35	
Dyberry	88	19	54.4	2.39	
East Bloomsburg	.....	.....	.....	2.83	
East Mauch Chunk	91	24	58.2	2.43	
Easton	81	27	59.0	1.60	
Ellwood Junction	.....	.....	.....	1.86	
Emporium	85	23	56.0	3.84	
Ephrata	93	28	61.0	0.80	
Forks of Neshaminy *[1]	83	32	58.4	2.69	
Franklin	86	25	58.6	2.31	
Freeport	.....	.....	.....	3.78	
Girardville	.....	.....	.....	3.32	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Grampian	.....	.....	.....	3.32	
Greensboro	89	30	59.8	3.58	
Hamburg	.....	.....	.....	2.00	
Hawthorn	92	24	59.1	3.28	
Hews Island Dam	.....	.....	.....	2.36	
Huntingdon *a*	92	26	58.8	3.08	
Huntingdon *b*	.....	.....	.....	2.51	
Irwin	.....	.....	.....	2.58	
Johnstown	89	29	59.8	2.61	
Keating	.....	.....	.....	4.75	
Kennett Square	89	31	61.2	2.16	
Lawrenceville	90	22	55.8	4.85	
Lebanon	92	25	59.6	1.35	
Leroy	85	26	56.6	3.88	
Lewisburg	89	25	58.7	3.05	
Lockhaven *a*	92	30	60.0	4.25	
Lockhaven *b*	.....	.....	.....	4.92	
Lock No. 4	.....	.....	.....	2.77	
Lycippus	89	32	61.2	2.70	
Mifflin	.....	.....	.....	4.25	
Oil City	.....	.....	.....	1.73	
Parker	.....	.....	.....	2.24	
Philadelphia	85	36	61.8	3.14	
Quakertown	91	26	58.8	3.02	
Reading[2]	.....	.....	58.0	0.88	
Renovo *a*	.....	.....	.....	4.36	
Renovo *b*	86	29	58.0	3.88	
Saegerstown	89	20	57.6	2.87	
St. Marys	85	24	55.7	3.88	
Selinsgrove	90	29	58.8	3.65	
Shawmont	.....	.....	.....	2.55	
Sinnamahoning	.....	.....	.....	0.66	
Smethport	87	20	55.4	5.10	
Somerset	92	26	54.6	2.15	
South Eaton	86	26	57.2	1.98	
State College	88	27	57.6	3.32	
Sunbury	.....	.....	.....	3.11	
Swiftwater	85	23	56.0	2.09	
Towanda	88	22	56.5	2.83	
Troutrun	.....	.....	.....	3.73	
Uniontown	86	33	59.6	4.15	
Warren	83	25	56.2	2.29	
Wellsboro	88	24	56.1	5.01	
Westchester	88	32	60.4	2.03	
West Newton	.....	.....	.....	2.62	
Westtown	84	32	58.8	2.87	
Wilkesbarre	90	25	59.6	2.59	
Williamsport	84	29	58.4	2.35	
York	88	25	59.2	1.51	
Rhode Island.					
Bristol	72	32	57.3	3.59	
Kingston	80	24	55.1	3.66	
Pawtucket	83	35	58.6	3.24	
Providence *a*	80	32	57.3	2.86	
Providence *c*	79	30	56.3	3.18	
South Carolina.					
Allendale	89	47	69.2	1.90	
Batesburg	89	43	68.0	3.71	
Beaufort	90	49	72.4	3.33	
Blackville	95	41	69.3	4.80	
Calhoun Falls	.....	.....	.....	6.61	
Camden	.....	.....	.....	2.90	
Cheraw *a*	90	33	67.7	3.16	
Cheraw *b*	.....	.....	.....	2.48	
Clemson College	87	45[e]	67.0	3.81	
Conway	.....	.....	.....	4.93	
Darlington	.....	.....	.....	1.92	
Edisto	.....	.....	.....	5.57	
Effingham	.....	.....	.....	2.49	
Florence	85	38	67.0	1.79	
Gaffney	.....	.....	.....	2.11	
Georgetown	86	47	68.8	5.55	
Gillisonville	90	41	69.0	1.99	
Greenville	87	41	63.7	2.86	
Greenwood	87	43	65.9	4.10	
Holland	82	39	63.2	5.08	
Kingstree *a*	86	40	66.5	5.24	
Kingstree *b*	.....	.....	.....	5.23	
Liberty	86	43	65.2	3.62	
Little Mountain	88	39	68.2	4.37	
Longshore	89	36	67.2	2.12	
Pinopolis *[1]	86	48	67.6	4.36	
St. George	87	45	68.9	3.49	
St. Matthews	90	42	69.1	2.96	
St. Stephens	.....	.....	.....	3.81	
Santuck	88	33	66.5	2.20	
Shaws Fork	92	42	68.6	2.48	
Smiths Mills	.....	.....	.....	8.44	
Societyhill	84	39	66.5	2.49	
Spartanburg	86	38	[illegible]	3.56	
Statesburg	89	41	69.5	2.15	
Summerville	84	45	68.0	5.00	
Temperance	91	36	68.3	3.48	
Trenton	83	48	69.2	2.84	
Trial	84	39	65.4	4.56	
Walhalla	81	42	64.1	5.19	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
	°	°	°	Ins.	Ins.
South Carolina—Cont'd.					
Winnsboro	84	41	66.0	2.70	
Winthrop College	87	38	66.4	2.16	
Yemassee	87	41	69.2	2.86	
Yorkville	90	42	68.4	2.92	
South Dakota.					
Aberdeen	...	...	...	2.10	
Academy	88	26	55.6	2.01	
Alexandria	88	23	55.8	3.90	
Armour	90	23	55.7	3.17	
Ashcroft	87	17	50.1	0.24	
Bowdle	82	20	49.8	0.45	
Brookings[1]	79[e]	23	54.3	2.72	
Centerville	...	...	...	1.64	
Chamberlain	97	26	55.4	0.40	
Clark	78	24	53.2	2.85	
Desmet	81	26	54.8	1.69	
Doland	81	20	53.1	1.68	
Elkpoint	89	32	60.2	1.60	
Farmingdale	...	...	...	0.14	
Faulkton	81	21	51.4	1.07	
Flandreau	84	28	55.9	1.45	
Forestburg	88	23	55.2	3.18	
Forest City	83	25	50.8	2.00	
Fort Meade	81	27	55.0	0.46	T.
Fort Randall	...	...	...	5.57	
Gannvalley	85	21	54.6	0.45	
Gary	81	29	53.0	2.05	
Grand River School	84	21	50.9	1.50	
Greenwood	88	29	58.3	2.97	
Hartman	86	28	57.1	2.58	
Hitchcock	...	...	...	2.63	
Hotch City	89	19	55.0	0.27	
Hot Springs	75	26	51.3	1.75	
Interior	81	25	54.2	1.50	
Ipswich	80	21	50.0	1.05	
Kimball	87[c]	24[b]	54.4[c]	1.07	
Leola	79	20	49.1	1.06	
Leslie	83	25	52.5	1.75	
Mellette	83	22	53.0	1.50	
Menno	88	29	56.8	3.02	
Millbank	81	28	55.5	0.91	
Mitchell	87	23	57.2	3.42	
Mound City	84[f]	18[f]	49.8[f]	0.54	
Oelrichs	81	22	50.2	0.60	
Parker	86	27	57.0	2.70	
Plankinton	85	21	54.2	3.48	
Redfield	82	21	52.0	1.63	
Rochford	77	10	46.3	0.35	
Rosebud	92	22	53.2	1.00	
St. Lawrence	83	18	52.9	0.64	
Silver City	...	...	...	0.22	0.5
Sioux Falls	86	24	55.8	1.69	
Sisseton Agency	78	26	53.0	1.86	
Spearfish	78	29	51.9	1.06	
Tyndall	92	21	55.2	2.10	
Watertown	80	25	53.8	1.45	
Waubay	78	24	50.5	1.29	
Wentworth	87	27	56.6	3.76	
Wolsey	...	...	...	1.23	
Tennessee.					
Andersonville	86	40	60.2	3.08	
Arlington	87	39	63.6	3.65	
Ashwood	...	...	...	4.80	
Benton	88	47	66.5	3.95	
Bluff City	...	...	...	1.55	
Bolivar	86	40	64.8	5.96	
Bristol	86	35	62.0	1.60	
Brownsville	87	40	63.8	4.37	
Byrdstown	89	41	65.8	1.97	
Carthage	91	...	...	3.38	
Clarksville	86	40	65.2	3.99	
Clinton	...	...	...	3.00	
Covington	89	41	65.0	4.41	
Decatur	87	45	65.6	5.52	
Dickson	89	40	64.6	3.68	
Dover	90	39	67.3	4.51	
Dyersburg	87	43	65.7	7.49	
Elizabethton	87	38	63.8	2.55	
Elk Valley	88	39	61.8	2.14	
Erasmus	85	37	61.2	3.96	
Florence	86	44	65.4	3.68	
Franklin	87	43	64.6	4.73	
Grace*[1]	88	48	64.6	2.30	
Greeneville	86	38	62.8	1.37	
Harriman	87	43	65.0	4.54	
Hohenwald	86	36	62.2	5.18	
Iron City	86	41	65.2	4.76	
Jackson	83[d]	43[d]	65.0[d]	6.80	
Johnsonville	90	45	66.4	8.06	
Jonesboro*[1]	84	44	60.9	1.22	
Kingston	...	...	...	3.58	
Lafayette*[5]	84	42	63.5	1.75	
Lewisburg	90	42	65.9	6.41	
Lynnville	88	42	65.6	6.90	
McKenzie	86	46	67.0	6.30	
McMinnville	92	44	66.2	1.80	
Tennessee—Cont'd.					
Maryville*[5]	91	46	66.2	2.53	
Milan	88	41	65.4	4.48	
Newport	88	43	64.8	1.54	
Nunnelly	85	40	64.6	4.82	
Oakhill	88	40	64.8	2.73	
Palmetto	89	43	66.1	6.66	
Peryear	...	...	...	5.65	
Pope	90	...	...	6.40	
Rogersville	85	40	63.2	2.00	
Rugby	85	36	62.2	2.22	
Savannah	86	41	66.4	6.30	
Sewanee	83	45	63.9	4.59	
Silverlake	78	34	57.4	4.32	
Springfield	90	40	64.9	3.60	
Tazewell	...	...	...	3.28	
Tellico Plains	90	44	66.6	3.04	
Tracy City	84	44	62.4	3.93	
Trenton	89	38	65.3	4.01	
Tullahoma	86	43	64.0	5.10	
Union City	88	40	64.2	2.50	
Wildersville	84	41	65.4	6.50	
Yukon	86	47	65.4	6.89	
Texas.					
Alvin	...	...	...	3.61	
Anna	98	40	70.6	4.76	
Anson	...	...	...	3.70	
Arthur	...	...	...	5.97	
Austin *a*	86[g]	42	68.0[d]	5.50	
Austin *b**[5]	94	45	70.8	...	
Ballinger	89	40	68.8	3.54	
Beaumont	98	47	70.8	2.20	
Beeville	96	41	71.0	3.68	
Bigspring	...	...	...	2.04	
Blanco	95	40	68.0	4.37	
Boerne*[1]	93	45	69.0	4.62	
Booth	...	...	...	3.45	
Bowie	91	42	68.6	2.44	
Brazoria	90	45	73.2	3.52	
Brenham	93	50	72.4	2.89	
Brighton	94	41	76.3	3.59	
Brownwood	97	42	67.7	1.65	
Burnet*[1]	86	45	68.6	1.22	
Camp Eagle Pass	101	39	72.3	5.50	
Coleman	91[e]	43[d]	68.9[e]	4.33	
Colorado	...	...	...	1.72	
Columbia	93	46	72.0	2.28	
Corsicana	93	43	71.2	2.70	
Cuero	93	46	72.1	2.54	
Dallas	91	44	69.2	3.71	
Danevang	91	47	72.2	2.94	
Dublin	90	45	67.2	3.86	
Duval	92	51	71.8	3.73	
Estelle	94	43	69.8	4.11	
Fort Brown	99	48	78.7	3.00	
Fort McIntosh	101	46	77.2	2.94	
Fort Ringgold	99	39	72.6	1.29	
Fort Stockton	...	...	...	2.50	
Fredericksburg*[1]	92[d]	40[c]	61.9[c]	2.45	
Gainesville	89	45	69.0	4.93	
Grapevine	93[e]	46[f]	70.6[f]	5.72	
Hale Center	86	41	64.0	3.21	
Hallettsville	92	46	71.8	3.95	
Haskell	...	...	...	0.76	
Henrietta	92	40	66.8	5.54	
Hondo	...	...	...	4.74	
Houston	99	50	71.5	1.75	
Huntsville	90	50	70.8	1.91	
Ira	103	43	72.2	1.26	
Jacksonville	91	42	69.2	4.48	
Jasper	91	50	71.6	4.07	
Kaufman	93	46	71.6	...	
Kerrville	91	...	...	2.25	
Kopperl	...	...	...	5.98	
Lampasas	95	39	70.3	2.19	
Laureles Ranch	...	...	...	3.30	
Llano*[5]	94	46	71.3	1.95	
Longview	92	48	73.4	3.78	
Luling	93	44	71.4	6.03	
Mann	92	43	69.6	3.92	
Menardville	91	34	66.6	2.30	
Mount Blanco	...	...	...	3.05	
Nacogdoches	87	45	68.9	4.04	
New Braunfels	91	46	70.8	3.78	
Panter*[5]	90	43	73.5	4.66	
Paris *a*	95	46	70.6	3.00	
Point Isabel*[1]	90	58	77.7	1.60	
Rhineland	95	38	67.5	1.82	
Rockisland	94	49	72.8	3.75	
Rockport*[1]	86	58	75.3	...	
Runge	98	44	74.3	3.59	
Saginaw*[1]	92	48	68.1	3.90	
Sanderson	92	49	69.9	4.60	
Santa Gertrudes Ranch	...	...	...	0.81	
Sugarland	93	46	72.0	1.70	
Sulphur Springs	92	47	69.2	5.44	
Temple *a*	91	44	70.4	1.42	
Texas—Cont'd					
Temple *b*	91	42	70.0	1.32	
Trinity	95	45	71.8	2.77	
Tyler	91	46	71.2	2.64	
Victoria	...	...	...	4.88	
Waco	92	48	71.7	1.15	
Waxahachie	93	44	69.8	2.55	
Weatherford	91	44	69.4	4.18	
Wichita Falls	...	...	...	7.10	
Utah.					
Alpine	...	...	...	1.55	2.0
Bluecreek*[1]	75	25	47.2	1.00	1.0
Castledale	74	24	51.8	0.00	
Cisco	78	26	53.0	...	...
Corinne	83	24	50.0	1.97	
Deseret	82	19	50.8	0.39	1.0
Fillmore	82	20	52.3	0.93	
Fishsprings	75[c]	26[c]	53.2[c]	0.42	
Fort Duchesne	78	17	46.6	0.27	
Frisco	70	20	50.8	0.77	
Giles	82	15	52.6	0.27	
Green River	82	18	52.8	0.50	
Grover	72	15	49.1	0.35	T.
Heber	75	16	47.0	1.47	T.
Henefer	71	11	40.6	1.82	2.0
Hite	86	30	60.6	...	
Holyoake	83	25	56.8	0.40	
Huntsville	...	...	...	2.88	0.5
Kelton*[1]	78	24	48.8	...	
Levan	75	20	48.7	0.69	3.5
Loa	68	−1	39.0	0.42	
Logan	72	24	49.8	2.38	
Manti	77	16	48.9	0.60	
Meadowville	83[c]	20[c]	43.2[c]	1.70	T.
Millville	...	...	...	1.88	
Minersville	73	18	49.6	0.62	
Moab	86	20	56.6	0.22	
Mount Pleasant	75	16	47.9	0.59	
Ogden*[1]	74	23	50.6	2.01	1.0
Park City	64	15	43.8	0.90	6.5
Parowan	73	15	48.5	0.56	0.7
Pinto	98	13	46.3	0.77	
Promontory*[1]	63	26	47.2	0.65	0.6
Provo	80[c]	22[b]	52.0[c]	0.66	
Richfield	77	20	48.8	0.05	
St. George	88	20	57.4	0.54	
Scipio	76	10	46.2	0.57	
Snowville	77	17	46.6	0.93	
Soldier Summit	73	5	39.8	0.20	2.0
Terrace*[1]	62	30	44.6	...	
Thistle	83	20	48.4	0.75	2.0
Tooele	74	24	51.1	1.53	8.0
Tropic	70	18	43.6	0.88	
Vernal	75	14	49.2	0.57	
Wellington	78	7	45.1	...	
Woodruff	67	13	40.0	...	
Vermont.					
Bennington	85	23	55.4	3.62	
Burlington	78	30	55.8	1.90	T.
Chelsea	74	18	50.8	3.19	
Cornwall	78	23	55.2	1.98	
Derby	81	20	51.8	3.79	
Enosburg Falls	83	18	53.6	3.54	
Hartland	79	18	51.2	3.05	
Jacksonville	80	15	50.4	1.80	
Manchester	81	19	53.4	2.64	
Norwich	80	17	51.8	3.04	
St. Johnsbury	75	18	50.5	2.70	T.
Vernon*[6]	75	22	51.8	2.68	
Wells	78	20	53.0	2.68	
Virginia.					
Alexandria	90	35	62.8	1.22	
Ashland	86	35	62.7	3.63	
Barboursville	93[g]	35[g]	63.8[g]	2.35	
Bedford	88	37	63.5	2.93	
Bigstone Gap	87	35	63.4	2.59	
Birdsnest*[1]	74	44	62.1	1.25	
Blacksburg	81	27	57.3	3.76	
Bon Air	84	38	63.1	3.97	
Buckingham	89	30	62.2	2.10	
Burkes Garden	76	26	54.0	4.14	
Callaville	85	34	63.9	0.95	
Christiansburg	...	...	...	3.85	
Cliftonforge	92	37	63.0	5.46	
Dale Enterprise	87	27	58.8	2.45	
Doswell	91	31	59.9	2.73	
Farmville	88	34	61.4	1.48	
Fontella	91	35	64.4	3.16	
Fredericksburg	87	34	63.0	5.32	
Grahams Forge	85	33	57.8	3.74	
Hampton	84	48	66.2	4.44	
Hot Springs	80	28	56.9	4.33	
Lexington	87	30	62.0	3.08	
Lincoln	86	31	60.6	...	
Manassas	85	33	60.8	1.67	
Marion	86	30	57.0	2.87	
Meadowdale	68	26	51.0	2.82	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Newport News	86	47	67.3	4.89	
Petersburg	89	37	64.7	2.82	
Radford	......	......	......	3.40	
Rockymount	83	35	61.0	3.65	
Salem	82	36	61.2	5.18	
Speers Ferry	......	......	......	2.09	
Spottsville	90	32	64.2	4.87	
Stanardsville	90	33	60.4	4.07	
Staunton	87	33	61.0	4.58	
Stephens City	90	31	61.8	3.26	
Sunbeam	90	32	65.3	1.92	
Warrenton	80	35	62.0	1.34	
Warsaw	85	35	63.4	2.12	
Westpoint	83	35	62.0	3.12	
Woodstock	85	31	60.2	2.55	
Wytheville	84	33	59.4	3.29	
Washington.					
Aberdeen	74	35	51.6	17.50	
Anacortes	......	......	......	2.86	
Ashford	......	......	......	9.22	
Bremerton	70	33	50.0	5.00	
Bridgeport	72	28	51.1	1.62	
Brinnon	64	36	49.6	10.87	
Cedonia	66	25	44.6	4.01	0.5
Centerville	78	20	46.6	1.83	
Chehalis	72	33	50.4	3.17	
Cheney	......	......	......	3.26	
Clearwater	66	33	49.4	17.64	
Cle Elum	73	26	45.1	3.09	
Colfax	82	27	49.0	4.21	T.
Colville	73	21	46.1	2.66	
Conconully	67	26	44.0	2.86	1.5
Connell	......	......	......	0.48	
Coupeville	64	38	51.6	2.27	
Crescent	71	26	46.3	2.93	
Dayton	79	30	51.4	2.76	
Ellensburg [1]	69	25	45.7	0.98	
Ellensburg (near)	70	28	46.6	1.25	
Grandmound	69	33	50.2	7.16	
Granite Falls	......	......	......	8.56	
Hooper	79	28	51.7	1.92	
Issaquah	......	......	......	7.69	
Lacenter	73	33	50.1	7.67	
Lakeside	68	33	49.6	2.07	
Lind	75	26	48.9	1.95	
Mayfield	61	29	45.0	6.15	
Mottinger Ranch	78	33	53.1	2.10	
Mount Pleasant	74	38	51.8	7.71	
Moxee Valley	75	21	48.0	0.83	
New Whatcom	70	30	51.3	2.98	
Northport	70	24	46.6	3.88	T.
Olga	64	36	49.2	2.76	
Olympia	70	34	50.2	8.26	
Pasco	75	26	54.4	1.52	
Pinehill	72	30	50.0	3.07	
Port Townsend	63	38	50.4	2.08	
Republic	72	23	43.4	2.22	1.0
Ritzville	......	......	......	0.95	
Rosalia	75	29	46.5	3.16	
Sedro	72	30	49.4	6.19	
Shoalwater Bay *[10]	67	41	52.0	......	
Snohomish	66	33	49.9	4.48	
Southbend	76	34	51.5	12.97	
Sprague	......	......	......	3.85	
Sunnyside	72	24	49.6	0.60	
Twin	62	34	48.0	8.13	
Union	70	32	48.2	12.72	
Usk	72	26	44.1	......	
Vancouver	72	32	50.6	4.25	
Vashon	68	38	49.8	5.20	
Waterville	67	25	43.6	2.89	3.0
Wenatchee (near)	71	27	45.4	2.73	
Westsound	67	32	50.2	3.09	
Wilbur	74	23	46.4	2.52	
West Virginia.					
Beckley	79	31	56.6	1.25	
Beverly	91	26	58.9	2.80	
Bluefield	81	33	59.2	2.94	
Buckhannon	87	26	58.5	3.87	
Burlington	87	27	58.6	1.55	
Camden	88	33	62.6	3.76	
Central	91	25	60.6	1.78	
Chapel	86	32	62.6	......	
Charleston	......	......	......	1.82	
Clay	92	34	64.6	......	
Creston	......	......	......	1.73	
Dayton	90	26	60.4	3.90	
Eastbank	89	45	62.3	1.25	
Elkhorn	81	36	60.4	2.03	
Fairmont	......	......	......	4.33	
Glenville	93	30	61.0	3.52	
Grafton	91	28	59.5	3.63	
Green Sulphur Springs	86	32	60.1	1.99	
Harpers Ferry	......	......	......	1.38	
Hinton *a*	......	......	......	2.42	
Hinton *b*	83	36	61.4	......	
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Huntington	87	31	62.0	1.69	
Josiah	93	29	62.8	1.44	
Lewisburg	85	31	58.8	4.80	
Magnolia	93	30	62.7	2.16	
Martinsburg	85	31	59.7	1.15	
Morgantown	92	30	61.0	3.91	
New Martinsville	97	29	63.2	1.45	
Nuttallburg	86	35	61.4	1.70	
Oceana	84	36	61.6	1.73	
Oldfields	86	28	58.3	1.81	
Parsons	85	29	57.6	2.50	
Philippi *a*	94	24	59.2	4.67	
Philippi *b*	......	......	......	4.45	
Point Pleasant	89	32	62.0	1.36	
Powellton	......	......	......	0.86	
Princeton	81	32	58.6	4.13	
Romney	89	28	59.2	1.94	
Rowlesburg	......	......	......	2.01	
Southside	89	36	64.2	1.25	
Spencer	90	21	62.8	2.28	
Terra Alta	86	21	57.4	2.00	
Uppertract	88	27	59.4	2.60	
Wellsburg	86	34	57.8	1.21	
Weston *a*	......	......	......	3.54	
Weston *b*	91	29	61.7	......	
Wheeling *a*	......	......	......	1.17	
Wheeling *b*	89	35	64.7	1.23	
Wiggins	84	34	60.6	......	
Williamson	87	37	64.8	1.80	
Winfield	86	34	62.7	1.60	
Wisconsin.					
Amherst	76	30	51.3	8.11	
Ashland	......	......	......	2.91	
Barron	72	10	49.9	5.40	
Bayfield	72	34	54.5	2.62	
Beloit	82	31	58.6	4.87	
Brodhead	86	26	57.8	3.53	
Butternut	77	27	53.9	6.02	T.
Citypoint	84	32	58.4	10.74	
Delavan	85	28	59.2	3.28	
Easton	81	28	57.6	7.25	
Eau Claire	77	30	57.2	9.41	
Florence	77	25	53.6	5.28	
Fond du Lac	81[e]	27[e]	57.8[e]	4.07	
Grand River Locks	......	......	......	6.98	
Grantsburg	83	30	57.9	4.43	
Hartford	82	26	57.8	2.83	
Hartland	82	28	57.6	3.15	
Harvey	86	29	57.4	4.70	
Hayward	82	28	56.5	5.57	
Heafford	76	27	53.6	6.05	
Hillsboro	86	25	55.9	5.84	
Knapp	82	22	53.2	7.46	
Koepenick	......	......	......	9.10	
Lancaster	86	28[e]	57.4	3.56	
Madison	81	34	58.0	4.43	
Manitowoc	73	32	54.2	4.84	
Meadow Valley	81	27	57.0	8.72	
Medford	80	23	54.6	10.75	
Menasha	......	......	......	5.86	
Neillsville	76	28	54.8	7.70	
New London	81	31	56.4	5.24	
Oconto	81	32	57.8	6.40	
Osceola	79	25	55.9	6.08	
Pepin	82	30	56.4	11.29	
Pine River	79	29	56.5	5.99	
Portage	81	31	57.4	4.70	
Port Washington	82	28	54.4	2.38	
Prairie du Chien *a*	89	34	61.4	5.42	
Prairie du Chien *b*	......	......	......	4.32	
Racine	87	35	57.9	1.87	
Shawano	86	30	56.2	10.02	
Sheboygan	75	34	56.0	6.04	
Spooner	82	30	56.4	6.52	
Stevens Point	79	29	56.2	6.85	
Sturgeon Bay Canal *[10]	69	32	52.9	......	
Two Rivers *[10]	65	36	54.6	......	
Valley Junction	82	28	56.6	10.77	
Viroqua	85	30	56.8	6.82	
Watertown	81	25	55.5	4.55	
Waukesha	80	37	57.6	2.34	
Waupaca	80	26	55.8	5.96	
Wausau	76	30	56.2	10.89	
Wausaukee	83	26	53.8	7.04	
Westbend	83	28	55.1	4.22	
Westfield	78	27	55.3	6.48	
Whitehall	79	26	57.0	7.39	
Wyoming.					
Alcova	77	22	49.8	0.70	T.
Basin	76	20	48.0	0.36	
Bitter Creek	76	8	41.7	0.40	
Burlington	73	20	47.8	0.60	......
Centennial	68	15	41.9	0.32	2.0
Cody	90	22	51.8	0.70	
Daniel	70	10	40.0	0.10	1.0
Evanston	66	10	39.6	1.39	T.
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Fort Laramie	89	9	50.6	0.42	
Fort Washakie	72	10	46.4	0.55	5.5
Fort Yellowstone	67	18	42.4	1.22	12.0
Fourbear	68	16	43.9	0.51	7.0
Hyattville	75	17	48.2	0.00	
Iron Mountain	73	19	47.0	0.17	T.
Kimball Ranch *	70	27	49.2	T.	T.
Laramie	70	21	45.2	0.61	3.6
Lovell	75	12	46.2	0.21	......
Lusk	75	15	46.8	0.23	
Parkman	78	23	48.4	0.32	......
Pinebluff	82	......	......	T.	T.
Rawlins	67	13	42.6	0.28	2.8
Saratoga	75	10	45.8	0.90	2.0
Sheridan	79	13	47.6	0.37	T.
South Pass City	64	13	39.3	1.81	8.0
Thermopolis	75	16	48.2	0.97	
Wheatland	82	28	56.8	0.84	T.
Cuba.					
Aguacate	94	62	78.1	4.36	
Alvarez	......	......	......	2.65	
Banaguises	93	65	78.2	8.35	
Batabano	91	66	78.6	8.35	
Camajuani	92	65	77.2	4.93	
Cardenas	98	70	81.5	5.59	
Cruces	......	......	......	5.65	
Gibara	95	64	79.4	2.03	
Guabairo	......	......	......	5.04	
Guanajay	89	67	79.4	4.45	
Guantanamo	92	65	79.6	2.89	
Holguin	93	67	79.9	3.86	
Limonar	93	......	......	6.85	
Magdalena	......	......	......	2.68	
Manzanillo	93	70	83.3	4.23	
Matanzas	93	64	77.9	5.04	
Moron Trocha	96	67	80.2	2.73	
Nuevitas	90	68	80.4	2.86	
Pinar del Rio	91	67	78.9	3.42	
San Cayetano	90	66	78.9	8.56	
Santa Clara	93	64	79.2	6.75	
Soledad	90	64	77.4	4.43	
Yaguapay	94	65	80.0	5.08	
Porto Rico.					
Adjuntas	88	67	79.8	10.94	
Aguadilla	88	75	82.0	4.17	
Arecibo	93	68	77.4	4.79	
Bayamon	98	65	79.6	6.83	
Canovanas	90	70	79.5	15.33	
Cayey	......	......	......	4.26	
Cidra	90	60	76.4	5.85	
Coamo[h]	96	66	79.9	1.96	
Comerio	92	64	77.4	4.50	
Corozal[i]	92	65	78.6	7.10	
Fajordo	93	71	81.4	7.62	
Hacienda Coloso	95	66	78.8	8.24	
Hacienda Peria	90	72	80.0	16.88	
Humacao	92	71	82.3	2.16	
Isabela	91	......	......	2.11	
La Isolina	90	65	76.6	6.43	
Lajas	93	63	78.0	4.46	
Manati	95	66	79.0	6.15	
Maunabo	89	73	81.5	11.60	
Mayaguez	95	68	80.3	12.47	
Morovis	89	66	76.6	8.68	
Port America	88	70	79.2	7.25	
Puerta de Tierra	91	72	81.0	6.36	
San German	94	60	80.2	8.45	
San Lorenzo	93	66	79.2	10.76	
Utuado[i]	92	73	82.6	5.81	
Vieques	88	70	79.4	3.85	
Waikato	93	65	78.6	7.08	
Yanco	93	66	80.0	5.86	
Mexico.					
Ciudad P. Diaz	93	54	73.4	4.60	
Coatzacoalcos	89	67	78.0	12.08	
Guanajuato	85	48	66.6	0.23	
Leon de Aldamas	83	45	69.6	0.16	
Puebla	77	43	54.2	0.93	
Tampico	90	63	78.6	5.09	
Topolobampo *[1]	97	66	79.0	0.87	
Vera Cruz	92	50	79.0	5.56	
New Brunswick.					
St. John	69	27	50.6	10.90	
Nicaragua.					
Rivas	88	73	80.1	21.93	

Late reports for September, 1900.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.	°	°	°	*Ins.*	*Ins.*
Coal Harbor	64	34	49.4	4.65	
Juneau	65	34	50.4	10.84	
Killisnoo	60	35	48.0	4.25	
Kodiak	68	36	50.4	1.95	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alaska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Nome	54	22	39.0	7.00	
Orca	......	......	......	15.32	
Tyoonok	67	32	48.8	4.22	
California.					
Craftonville	96	45	67.0	1.04	
Kernville	......	......	......	0.79	
Yuba City*[5]	94	52	70.6	0.10	
Idaho.					
Burnside	82	24	54.5	0.75	
Moscow	86[c]	40[c]	61.2[c]	0.79	
Illinois.					
Havana	98	40	74.1	2.65	
Kansas.					
Delphos	101	46	73.0	5.00	
Yates Center	99	43	72.0	9.73	
Maine.					
Bar Harbor	90	......	......	3.15	
Michigan.					
Petoskey	......	......	......	8.89	
Missouri.					
Fulton	92	43	69.6	3.60	
Montana.					
Marysville	82	11	48.8	1.94	2.5
Ovando	84	13	49.0	1.64	......
Nebraska.					
Bartley	......	......	......	1.08	
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Willard	......	......	......	1 12	
New Jersey.					
Toms River	95	37	68.8	1.95	
North Carolina.					
Highlands	79[c]	38[c]	63.6[c]	4.99	
Ohio.					
Springfield	......	......	......	2.10	
South Dakota.					
Canton	92	29	62.4	0.95	
Gary	88	30	58.0	4.65	
Highmore	......	......	......	4 39	
Tyndall	100	30	62.0	1.35	
Texas.					
Victoria	......	......	......	0.91	
Washington.					
Colville	89	25	53.3	0.67	
Lakeside	85	38	61.3	0.84	
West Virgina.					
Powellton	......	......	......	1.59	
Wisconsin.					
Heafford	86	31	58.0	8.76	
Mexico.					
Coatzacoalcos	......	......	......	7.32	
Guanajuato	86	52	68 0	1.76	
Vera Cruz	95[j]	72[g]	81.3[i]	2.81[e]	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[8] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

TABLE III.—*Mean temperature for each hour of seventy-fifth meridian time, October, 1900.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midn't.	Mean.
Bismarck, N Dak....	44.9	43.8	43.6	43.1	42.2	41.1	40.2	39.8	40.4	43.6	47.4	51.3	54.6	57.0	59.0	59.9	60.2	59.7	56.1	52.7	50.2	48.4	46.8	45.2	48.8
Boston, Mass	53.3	52.6	52.5	52.3	52.3	52.1	52.5	53.9	55.6	57.0	58.4	59.8	60.5	61.2	61.4	60.8	59.9	58.7	57.5	56.4	55.5	54.7	54.2	53.5	56.1
Buffalo, N. Y..........	57.8	57.6	57.3	57.0	56.9	56.6	56.9	57.7	59.8	61.4	63.1	64.1	64.9	65.4	65.1	64.7	63.9	62.5	61.3	60.8	60.1	59.5	58.7	58.4	60.5
Cedar City, Utah....	49.2	48.7	48.4	47.0	46.4	45.4	45.3	44.8	43.9	45.6	49.9	53.2	55.3	57.0	58.5	59.7	60.4	60.4	59.4	56.9	53.6	51.8	50.5	49.2	51.7
Chicago, Ill...........	59.6	58.9	58.2	57.4	56.7	56.3	56.0	56.1	57.5	59.3	61.3	63.0	64.5	65.1	65.5	65.7	65.5	64.1	63.1	62.4	61.9	61.2	60.8	60.3	60.8
Cincinnati, Ohio....	60.2	59.3	57.9	57.0	56.1	55.4	54.6	56.2	59.0	62.8	66.5	69.2	71.2	72.7	73.3	73.6	73.0	71.8	69.6	68.1	66.1	64.6	63.2	61.7	64.3
Cleveland, Ohio	57.7	57.3	56.6	55.8	55.2	54.9	54.6	55.4	58.5	61.3	64.0	65.1	66.1	66.8	67.0	67.1	66.9	65.9	64.3	63.0	62.0	60.5	59.5	58.8	61.0
Detroit, Mich........	56.9	56.3	56.0	55.5	55.1	54.7	54.2	54.7	56.5	59.3	61.6	63.5	64.8	65.7	66.2	66.2	65.9	64.5	62.5	61.1	60.1	59.1	58.6	57.9	59.9
Dodge, Kans..........	55.7	55.2	54.9	53.8	53.0	52.7	51.5	50.5	52.5	56.4	61.3	64.4	67.9	69.7	71.5	72.7	72.4	71.5	67.4	62.1	59.6	58.1	56.5	55.7	60.3
Eastport, Me..........	48.1	47.7	47.6	47.5	47.1	46.9	47.0	47.7	48.8	50.2	51.5	52.5	53.0	53.7	53.4	52.9	51.7	50.8	50.2	49.9	49.4	48.8	48.3	48.0	49.7
Galveston, Tex.......	74.7	74.3	73.7	73.4	73.4	73.2	72.8	73.2	73.9	75.8	77.2	78.5	79.2	79.6	80.0	79.4	79.7	78.7	77.5	76.3	75.6	75.3	75.0	74.5	76.0
Havre, Mont..........	42.4	41.5	40.4	40.2	39.8	39.5	39.3	39.3	39.0	40.5	43.9	47.0	50.7	53.4	55.5	57.0	57.3	56.5	53.9	52.0	49.1	47.3	45.1	43.8	46.4
Independence, Cal..	57.7	56.9	55.5	54.2	53.1	52.0	51.3	50.6	48.8	49.7	53.2	57.5	60.1	64.7	67.6	69.2	70.1	70.1	69.0	67.7	63.3	61.3	59.8	58.5	59.3
Kalispell, Mont	40.2	39.3	38.8	38.3	37.9	36.9	36.5	36.1	35.7	35.8	37.7	41.1	44.0	46.5	48.6	49.9	51.2	51.0	50.1	47.9	45.6	43.3	42.4	41.2	42.3
Kansas City, Mo.....	60.7	60.0	59.1	58.6	57.7	56.9	56.1	55.7	57.1	60.0	63.7	66.3	68.3	69.7	67.5	71.4	71.3	70.4	68.7	66.2	64.6	66.6	62.4	61.0	63.3
Key West, Fla........	78.3	77.9	78.0	77.6	77.5	77.5	77.6	79.4	80.1	80.6	81.7	81.9	82.0	81.8	81.8	81.4	81.0	79.9	79.2	79.2	78.5	78.6	75.8	78.4	79.5
Marquette, Mich	54.0	53.6	53.2	53.1	52.7	52.5	52.3	51.9	52.9	54.3	56.3	57.9	59.7	60.5	60.8	60.5	59.8	58.9	57.5	55.5	55.8	55.5	55.0	54.7	55.8
Memphis, Tenn.......	64.4	63.4	62.9	62.3	61.5	61.3	60.3	60.7	62.1	64.7	67.2	69.8	71.5	73.2	73.5	73.7	73.5	72.7	7..9	69.4	68.1	66.9	66.1	65.1	66.9
Mt. Tamalpais, Cal..	54.9	54.7	54.6	54.5	53.9	53.5	53.1	53.1	52.4	52.4	53.1	53.8	54.3	55.5	57.0	58.0	58.2	57.9	57.1	56.2	55.6	55.4	55.1	54.8	55.0
New Orleans, La.....	70.5	69.9	69.5	69.0	68.7	68.5	68.4	69.1	71.6	73.9	75.9	77.0	78.0	78.6	78.7	78.3	77.5	76.0	74.6	73.5	72.4	71.8	71.3	70.7	73.1
New York, N. Y.....	58.5	58.0	57.4	57.0	56.7	56.7	56.7	57.4	58.2	59.6	61.4	63.1	64.4	65.4	65.7	65.0	64.1	62.8	61.6	60.8	60.1	59.7	59.0	58.4	60.3
Philadelphia, Pa.....	58.1	57.4	56.9	56.6	56.2	55.9	56.6	58.2	60.0	61.9	63.5	65.1	66.9	67.3	67.5	66.7	65.8	64.4	63.1	61.6	60.9	60.2	59.3	58.5	61.2
Pittsburg, Pa.........	57.8	57.2	56.2	55.8	55.3	54.5	54.1	55.2	57.7	60.8	64.6	67.4	69.7	70.8	71.6	71.9	70.3	68.8	66.5	64.8	62.7	61.3	60.1	59.2	62.3
Portland, Oreg......	51.5	50.7	49.9	49.4	49.0	48.4	47.9	47.7	46.5	46.0	46.8	48.1	50.0	52.2	54.4	56.1	57.5	58.0	58.0	57.3	55.9	54.3	53.3	52.5	51.7
St. Louis, Mo.........	62.4	61.6	60.3	59.5	58.8	58.3	57.9	58.0	59.6	62.2	66.2	68.9	70.6	72.1	72.9	73.3	73.1	71.9	70.1	68.4	67.0	65.6	64.4	63.2	65.3
St. Paul, Minn.......	55.7	55.1	54.4	53.7	53.2	52.7	51.9	51.5	51.9	54.0	56.7	58.9	61.0	62.4	63.3	64.2	64.4	63.2	61.7	59.9	58.5	57.6	56.9	56.1	57.5
Salt Lake City, Utah.	49.7	48.8	48.0	48.0	46.6	46.3	46.0	45.8	45.3	47.2	50.7	53.9	56.3	57.8	59.3	60.0	60.5	60.3	58.9	57.0	53.7	52.4	50.7	49.8	52.2
San Diego, Cal.......	61.4	60.9	60.2	60.0	59.9	59.6	59.3	58.9	58.6	58.8	61.3	63.3	65.5	66.5	67.1	67.2	67.2	66.9	66.2	65.0	64.2	63.5	62.9	62.1	62.8
San Francisco, Cal...	56.1	55.8	55.1	54.6	53.9	53.7	53.5	54.7	53.5	53.9	55.2	56.5	58.7	60.3	62.4	63.4	63.8	63.1	61.7	60.4	59.3	58.4	57.5	56.9	57.6
Santa Fe, N. Mex ...	47.9	47.7	46.1	44.9	44.0	43.4	43.0	42.4	42.5	47.8	51.0	52.8	54.9	56.7	58.3	59.3	59.8	58.8	56.5	53.5	50.8	49.9	48.9	48.5	50.4
Savannah, Ga........	67.8	67.1	66.7	66.1	65.8	65.6	65.5	66.9	70.3	72.6	74.8	76.3	76.5	77.1	77.5	76.6	75.2	73.0	71.3	70.4	69.6	68.8	68.4	68.0	70.7
Washington, D. C....	57.4	56.7	55.9	55.6	55.3	55.0	55.1	57.5	59.5	62.5	65.4	66.8	68.0	69.1	69.5	69.1	67.9	65.6	62.8	61.0	59.6	58.9	58.1	57.6	61.2
West Indies.																									
Basseterre, St. Kitts.	78.6	78.5	78.3	78.2	78.2	79.5	82.0	82.4	83.8	84.6	85.3	84.9	84.5	83.8	82.8	81.5	80.3	79.7	79.6	79.6	79.2	79.2	79.0	78.7	80.9
Bridgetown, Bar.....	76.8	76.4	76.3	76.3	76.4	78.2	81.8	83.3	83.8	84.9	84.8	84.1	83.4	83.4	82.8	81.9	80.4	79.1	78.1	77.9	77.8	77.6	77.5	77.2	80.0
Cienfuegos, Cuba ...	73.1	72.6	72.0	71.8	71.5	71.5	72.5	76.2	80.1	82.3	84.5	84.5	85.1	84.8	84.1	83.4	81.9	79.6	78.4	77.1	76.4	75.8	74.7	73.9	77.8
Havana, Cuba.........	76.3	75.5	75.0	74.6	74.3	74.3	74.4	77.1	80.3	82.7	83.6	84.3	83.9	83.9	82.8	82.7	81.7	80.3	79.3	79.0	78.3	77.9	77.2	76.7	79.0
Kingston, Jamaica..	73.0	72.7	72.5	72.0	71.9	71.8	73.3	77.5	82.1	84.4	85.2	85.4	84.5	82.6	81.6	81.5	80.7	78.8	77.2	76.5	75.6	74.7	74.1	73.6	77.6
Port of Spain, Trin..	75.4	75.1	74.6	74.6	74.3	75.8	79.5	81.1	83.8	85.2	85.4	84.8	85.4	83.9	83.1	82.5	80.8	79.5	78.8	78.3	77.5	76.8	76.3	75.9	79.5
P. Principe, Cuba ...	72.2	71.3	70.5	70.3	69.8	69.7	69.9	75.4	78.4	81.5	83.8	85.6	86.9	87.2	87.2	84.8	82.7	79.7	77.5	75.8	74.8	74.2	73.6	72.7	77.3
Roseau, Dominica ..	76.2	76.0	76.0	76.0	75.9	76.9	80.6	81.9	83.8	84.6	85.2	85.4	85.3	84.9	84.3	83.2	80.9	79.2	78.3	77.9	77.4	77.2	76.9	76.5	80.0
San Juan, P. R.......	76.1	75.6	75.2	75.3	74.9	75.5	77.5	79.8	84.1	84.0	83.9	83.9	84.1	83.9	82.8	81.7	80.5	79.4	78.9	78.4	77.7	77.4	77.0	76.5	79.3
Santiago de Cuba...	74.7	73.8	73.3	73.0	72.9	73.0	75.2	77.6	82.4	84.6	86.2	86.5	86.5	86.1	85.4	84.2	81.7	80.4	79.1	78.2	77.2	76.6	76.0	75.2	79.2
Santo Domingo, S. D.	74.0	73.6	73.4	73.2	72.8	72.7	74.5	78.1	81.1	82.8	83.8	84.0	84.9	82.9	81.8	80.8	80.1	79.0	77.9	76.9	75.9	75.3	74.9	74.3	77.8
Willemstad, Curaçao	75.9	79.1	78.8	78.8	78.5	78.7	80.8	82.6	83.9	84.2	84.5	84.5	85.5	85.9	85.4	84.5	82.8	81.5	81.2	81.0	80.8	80.6	80.2	80.0	81.8

TABLE IV.—*Mean pressure for each hour of seventy-fifth meridian time, October, 1900.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midn't.	Mean.
Bismarck, N. Dak....	28.186	.185	.186	.186	.191	.196	.199	.199	.204	.207	.202	.198	.185	.171	.156	.151	.152	.155	.160	.163	.171	.178	.182	.182	.181
Boston, Mass.........	30.019	.014	.014	.014	.020	.025	.035	.042	.043	.044	.037	.026	.015	.007	.004	.004	.008	.016	.020	.023	.028	.027	.028	.027	.022
Buffalo, N. Y..........	29.312	.312	.311	.312	318	.322	.329	.337	.343	.343	.342	.344	.318	.312	.300	.297	.296	.300	.305	.307	.310	.312	.311	.308	.316
Cedar City, Utah....	24.273	.272	.273	.274	.271	.267	.272	.276	281	.292	.303	.306	.302	.293	.274	.260	.257	250	.248	.251	.258	.267	.273	.275	.274
Chicago, Ill.	29.209	.210	.211	.209	.213	.215	.222	.234	.241	.245	.245	.238	.221	.205	.191	.189	.185	.188	.190	.191	.192	.196	.198	.197	.210
Cincinnati, Ohio	29.458	.459	.455	.458	.463	.470	.480	.484	.496	.495	.489	.474	.453	.435	.428	.422	.422	.426	.434	.439	.450	.455	.453	.452	.456
Cleveland, Ohio	29.320	.319	.318	.320	.327	.334	.341	.346	.351	.350	.347	.338	.321	.310	.303	.296	.295	.300	.305	.307	.313	.315	.313	.313	.321
Detroit, Mich.........	29.332	.336	.334	.333	.337	.344	.349	.359	.366	.368	.367	.360	.345	.329	.318	.313	.313	.318	.323	.325	.327	.330	.326	.325	.337
Dodge, Kans	27.388	.389	.388	.387	.386	.390	.395	.395	.405	.413	.414	.406	.392	.370	.350	.341	.333	.332	.341	.359	.370	.382	.390	.392	.379
Eastport, Me	30.041	.037	.037	.039	.044	.052	.065	.075	.075	.075	.068	.059	.049	.044	.039	.039	.043	.048	.051	.053	.053	.052	.050	.049	.052
Galveston, Tex.......	29.929	.928	.923	.918	.920	.925	.935	.940	.956	.961	.960	.952	.933	.911	.897	.891	.890	.892	.899	.907	.920	.928	.934	.932	.924
Havre, Mont..........	27.269	.266	.266	.269	.267	.266	.269	.270	.273	.276	.281	.282	.275	.266	.258	.246	.243	.244	.246	.251	.255	.259	.265	.266	.264
Independence, Cal ..	25.957	962	.966	.965	.965	.964	.966	.972	.978	.989	.999	.004	.003	.992	.970	.932	.933	924	.921	.920	.926	.937	.952	.961	962
Kalispell, Mont	26.880	.882	.883	.886	.884	.881	.881	.885	.891	.899	.904	.903	.898	.890	.876	.865	.861	.858	.858	.861	.866	.871	.876	.881	.880
Kansas City, Mo.....	29.014	.014	.014	.011	.013	.018	.022	.026	.038	.045	.045	.040	.025	.005	.988	.979	.975	.974	.979	.990	.995	.003	.008	.009	.010
Key West, Fla.......	29.926	.918	.912	.909	.912	.921	.932	.942	.952	.955	.953	.940	.922	.909	.897	.891	.893	897	.906	.918	.932	.938	.938	.934	.923
Marquette, Mich ...	29.245	.249	.247	.244	.249	.251	.260	.265	.262	.262	.255	.247	.227	.216	.208	.205	.210	.214	.223	.222	.225	.223	.222	.224	.236
Memphis, Tenn......	29.649	.648	.648	.646	.649	.657	.663	.677	.687	.693	.693	.687	.670	.645	.629	.627	.621	.622	.625	.632	.643	.649	.651	.651	.653
Mt. Tamalpais, Cal .	27.541	.541	.542	.542	.539	.533	.533	.536	.536	.545	.561	.571	.579	.580	.573	.560	.552	.545	.541	.537	.539	.544	.548	.551	.549
New Orleans, La.....	29.953	.950	.948	.946	.948	.956	.965	.975	.986	.988	.988	.981	.961	.942	.930	.923	.922	.926	.935	.945	.952	.957	.957	.956	.954
New York, N. Y.....	29.828	.825	.822	.825	.830	.836	.848	.856	.858	.856	.848	.836	.820	.809	.803	.802	.806	.813	.823	.828	.834	.835	.837	.836	.830
Philadelphia, Pa.....	30.050	.045	.040	.044	.051	.058	.068	.079	.081	.079	.068	.053	.038	.030	.025	.025	.031	.037	.044	.051	.057	.058	.058	.058	051
Pittsburg, Pa.........	29.250	.248	.245	.246	.251	.258	.269	.279	.283	.279	.273	.263	.244	.225	.215	.212	.215	.221	.230	.237	.245	.249	.249	.249	.247
Portland, Oreg......	29.806	.807	.810	.810	.814	.812	.812	.813	.815	.817	.822	.826	.826	.825	.818	.807	.797	.793	.793	.792	.794	.799	.805	.812	.809
St. Louis, Mo.........	29.455	.457	.456	.456	.460	.465	.473	.483	.491	.494	.490	.481	.464	.445	.431	.423	.420	.422	.431	.436	.442	.447	.448	.447	.455
St. Paul, Minn........	29.074	.074	.080	.082	.079	.082	.084	.084	.086	.089	.090	.088	.076	.064	.045	.036	.036	.039	.045	.052	.055	.059	.064	.065	.068
Salt Lake City, Utah.	25.622	.624	.626	.629	.630	.630	.634	.637	.643	.651	.660	.661	.558	.650	.635	.622	.611	.606	.605	.606	.611	.615	.623	.628	.630
San Diego, Cal.......	29.844	.846	.844	.844	.843	.839	.839	.843	.849	.858	.869	.875	.874	.867	.851	.839	.828	.824	.821	.822	.827	.836	.845	.852	.845
San Francisco, Cal...	29.859	.862	.861	.862	.863	.858	.856	.859	.866	.873	.883	.890	.894	.891	.883	.868	.855	.849	.844	.840	.844	.850	.859	.866	.864
Santa Fe, N. Mex ...	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Savannah, Ga........	30.001	.997	.991	.992	.997	.006	.018	.031	.040	.044	.039	.026	.006	.992	.985	.983	.985	.988	.999	.006	.011	.014	.012	.006	.007
Washington, D. C....	30.049	.048	.047	.049	.053	.061	.070	.081	.089	.090	.083	.071	.048	.036	.027	.024	.026	.033	.038	.043	.051	.055	.055	.056	.054
West Indies.																									
Basseterre, St. Kitts.	29.879	.867	.860	.863	.874	.888	.905	.915	.929	.921	.905	.887	.868	.859	.856	.861	.869	.879	.894	.906	.912	.910	.903	.895	.888
Bridgetown, Bar....	29.851	.842	.843	.846	.855	.868	.883	.895	.898	.892	.875	.851	.834	.824	.823	.827	.833	.847	.862	.875	.881	.881	.877	.865	.860
Cienfuegos, Cuba ...	29.850	.840	.831	.830	838	.848	.863	.873	.883	.884	.875	.857	.834	.816	.809	.809	.817	.825	.841	.859	.872	.873	.868	.862	848
Havana, Cuba........	29.867	.858	.848	.845	.851	.862	.875	.888	.895	.900	.893	.881	.859	.838	.829	.828	.832	.842	.852	.870	.881	.887	.886	.877	.864
Kingston, Jamaica..	29.592	.577	.566	.564	.566	.576	.595	.605	.617	.617	.604	.585	.556	.544	.532	.531	.540	.550	.566	.581	.601	.609	.610	.607	.579
Port of Spain, Trin..	29.815	.807	.809	.817	.834	.853	.869	.880	.878	.861	.835	.812	.790	.782	.779	.786	.795	.809	.825	.840	.849	.848	.841	.829	.827
P. Principe, Cuba ...	29.565	.551	.542	.541	.548	.557	.570	.583	.592	.596	.586	.572	.551	.532	.522	.523	.531	.542	.551	.570	.578	.585	.582	.574	.560
Roseau, Dominica ..	29.866	.855	.853	.855	.865	.877	.889	.905	.910	.906	.888	.865	.850	.840	.837	.840	.847	.859	.874	.889	.894	.895	.890	.879	.872
San Juan, P. R.......	29.832	822	.816	.823	.833	.845	.858	.869	.877	.870	.854	.835	.817	.804	.796	.804	.811	.823	.838	.851	.856	.861	.853	.845	.837
Santiago de Cuba....	29.808	.799	.785	.785	.794	.807	.820	.827	.841	.839	.821	.799	.775	.759	.754	.755	765	.776	.796	.815	.828	.831	.828	.823	.801
Santo Domingo, S. D.	29.858	.846	.840	.840	.853	.868	.885	.898	.906	.902	.887	.865	.840	.825	.819	.822	.830	.842	.856	.872	.880	.885	.882	.873	.861
Willemstad, Curaçao	29.754	.744	.740	.743	.758	.773	.791	.801	.809	.800	.772	.749	.719	.698	.687	.686	.696	.710	.739	.762	.778	.785	.780	.772	.752

TABLE V.—*Average wind movement for each hour of seventy-fifth meridian time, October, 1900.*

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex	6.5	6.6	6.3	6.5	7.4	7.6	7.4	7.2	7.5	9.2	10.8	11.4	11.0	10.8	10.5	10.2	10.2	9.2	7.5	5.5	5.2	5.8	5.7	6.6	8.0
Albany, N. Y	5.3	5.2	5.6	5.4	5.5	5.9	5.8	6.9	7.6	8.0	8.5	8.8	8.7	9.0	8.4	8.1	7.5	6.5	5.9	5.8	6.1	6.3	6.3	6.1	6.8
Alpena, Mich	6.7	7.3	7.4	7.4	7.2	6.8	7.4	7.2	8.2	8.9	8.6	10.2	11.7	12.6	12.5	12.8	12.3	11.2	9.4	8.9	8.2	8.1	7.9	7.9	9.0
Amarillo, Tex	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Atlanta, Ga	9.8	9.7	9.5	9.2	9.0	9.3	9.4	9.5	9.4	9.7	10.0	10.2	10.2	10.0	10.8	10.1	9.8	8.9	8.5	9.6	9.6	10.2	10.2	10.0	9.7
Atlantic City, N. J	9.7	9.4	9.0	9.2	9.6	9.7	10.0	11.0	12.1	11.8	12.0	11.5	11.9	12.0	12.0	11.6	10.5	10.1	9.8	10.7	10.8	10.5	10.5	10.2	10.6
Augusta, Ga	4.3	4.3	4.2	4.1	4.7	4.3	4.4	5.3	6.3	6.7	7.2	7.8	8.0	7.5	7.6	7.3	6.6	5.9	4.7	4.2	4.4	4.6	4.5	4.5	5.6
Baker City, Oreg	5.6	6.1	6.2	6.1	6.2	5.8	5.3	5.4	5.4	4.7	5.0	4.5	4.2	4.4	4.9	6.1	6.3	6.8	6.0	4.7	3.6	3.7	4.8	5.2	5.3
Baltimore, Md	3.9	3.9	3.7	4.2	4.1	4.1	4.5	4.7	5.2	5.8	6.4	5.9	6.1	6.1	6.4	6.5	5.6	4.4	3.9	4.2	4.3	4.4	3.9	3.7	4.8
Bismarck, N. Dak	6.0	6.4	6.6	6.9	7.2	6.9	7.3	7.9	7.6	7.7	8.8	9.7	11.1	11.3	11.0	11.1	11.1	10.1	7.5	6.7	7.0	6.1	5.8	5.6	8.1
Block Island, R. I	19.2	19.4	19.2	19.0	19.1	19.5	19.7	20.3	19.9	19.7	19.0	17.8	18.8	19.5	19.2	18.7	19.1	19.4	18.5	18.6	19.1	18.6	19.2	19.2	19.2
Boise, Idaho	3.2	3.7	3.6	3.8	4.2	4.0	3.8	3.6	3.6	3.1	3.6	4.0	5.3	5.5	5.5	5.5	5.4	5.0	4.6	3.8	3.2	3.1	3.3	3.7	4.1
Boston, Mass	9.6	10.0	10.3	10.0	10.1	10.2	10.6	10.8	11.2	11.5	11.5	11.5	11.7	11.3	11.4	11.1	10.5	10.1	9.6	9.6	9.4	9.7	9.7	9.2	10.5
Buffalo, N. Y	10.5	10.2	9.9	10.3	10.5	10.3	10.2	10.8	10.6	11.8	11.4	11.3	11.5	11.9	11.7	12.1	11.9	11.2	11.2	11.6	11.6	11.9	11.9	11.3	11.1
Cairo, Ill	5.3	5.0	5.2	5.2	5.6	5.5	5.4	5.3	5.6	6.5	7.4	7.8	8.7	8.9	9.2	9.2	8.7	6.8	6.0	6.0	5.3	5.1	5.4	5.4	6.4
Cape Henry, Va	12.6	12.4	13.0	13.1	13.6	13.2	14.0	14.3	15.1	15.1	14.8	14.5	14.1	13.9	13.9	13.5	13.1	12.3	12.0	12.8	12.3	12.7	12.6	12.5	13.4
Carson City, Nev	7.3	6.9	6.7	6.3	5.6	5.8	6.3	6.5	6.7	6.5	6.5	7.0	7.1	7.6	8.1	9.8	10.1	9.4	9.8	10.6	10.4	9.2	9.1	7.3	7.8
Cedar City, Utah	6.9	6.6	6.7	6.8	6.4	6.0	5.9	5.9	5.8	5.8	5.0	6.4	7.5	7.7	8.6	8.8	9.1	8.6	8.5	7.8	5.9	6.1	6.3	6.2	6.9
Charleston, S. C	10.0	9.7	10.8	11.1	11.1	10.9	10.7	12.1	12.0	12.6	13.7	13.5	14.0	14.9	14.5	14.1	13.2	11.9	10.9	11.2	11.1	10.7	10.4	10.5	11.9
Charlotte, N. C	5.5	5.8	5.5	5.5	5.8	5.9	6.1	6.2	7.0	7.5	8.2	7.5	7.3	6.9	6.6	6.2	5.6	4.6	4.8	4.8	5.1	5.3	5.7	5.1	6.0
Chattanooga, Tenn	4.5	4.0	4.0	4.0	4.0	4.0	3.5	4.2	4.8	6.0	6.8	7.8	8.2	9.0	8.5	8.3	7.7	7.0	5.7	4.4	4.6	4.0	4.3	4.2	5.6
Cheyenne, Wyo	8.0	8.4	9.0	8.7	8.9	8.9	8.0	8.1	7.9	9.2	11.3	12.7	14.8	14.8	15.5	14.9	14.3	13.4	11.5	8.8	8.7	8.6	9.2	8.4	10.5
Chicago, Ill	15.4	15.6	14.9	14.8	15.1	14.4	14.9	14.7	14.5	14.4	14.4	14.5	16.4	16.0	16.1	15.5	15.2	14.9	15.0	14.9	16.1	16.0	16.2	16.2	15.2
Cincinnati, Ohio	4.0	3.5	3.3	3.2	3.4	3.2	3.5	3.6	4.3	5.2	6.0	6.0	7.3	7.2	7.6	7.2	7.2	6.6	5.7	5.9	4.8	4.6	4.3	4.1	5.1
Cleveland, Ohio	13.2	13.2	13.5	13.9	13.8	13.8	13.3	13.0	13.0	12.4	12.1	11.9	12.0	12.2	11.8	12.2	11.7	10.6	10.3	11.3	11.9	12.5	13.5	14.0	12.5
Columbia, Mo	5.6	5.5	5.5	5.3	5.3	5.9	6.0	6.0	6.0	6.8	6.9	7.5	7.6	7.9	7.5	7.6	7.0	6.1	5.3	5.7	6.0	6.4	6.4	6.4	6.3
Columbus, Ohio	4.9	4.9	4.5	4.8	4.8	5.2	4.8	4.9	5.5	5.8	6.7	7.0	7.4	7.5	7.8	7.7	7.3	5.8	6.1	5.8	6.0	6.5	6.5	5.7	6.0
Concordia, Kans	8.5	7.7	7.3	7.2	7.5	6.6	6.5	6.4	6.7	8.1	10.2	10.3	10.0	9.7	10.0	10.6	10.4	9.4	7.2	6.7	7.9	8.3	8.7	8.5	8.3
Corpus Christi, Tex	11.0	10.3	9.9	9.3	8.4	8.4	7.7	8.0	8.0	7.6	8.6	8.9	10.0	10.9	12.4	12.7	13.7	14.2	13.6	12.5	11.5	11.4	11.8	11.2	10.5
Davenport, Iowa	4.5	4.8	4.9	4.6	4.9	4.3	4.7	4.9	5.7	6.4	6.6	7.6	8.7	8.6	8.7	8.8	7.9	6.8	4.7	4.7	5.4	5.1	5.0	5.3	6.0
Denver, Colo	8.1	6.9	6.4	6.7	6.3	6.9	7.1	7.0	6.9	7.2	6.4	6.0	6.9	8.7	9.8	9.8	10.9	10.9	10.2	8.8	7.6	7.0	6.6	7.2	7.8
Des Moines, Iowa	6.4	6.2	6.0	5.8	5.5	5.4	5.6	5.5	5.8	7.4	9.0	9.5	11.0	11.8	11.4	10.9	10.7	8.8	7.2	6.7	6.3	6.8	6.5	6.3	7.6
Detroit, Mich	7.3	7.1	6.8	6.8	6.8	7.0	7.0	6.7	6.8	7.5	8.1	8.6	9.3	9.6	9.7	9.5	9.1	8.2	7.3	7.7	7.6	7.7	7.9	8.4	7.9
Dodge, Kans	10.1	10.0	10.3	9.5	9.0	8.9	9.2	9.3	9.0	11.2	14.0	14.0	14.9	15.3	15.6	16.1	16.0	15.0	11.9	9.6	10.7	10.1	10.3	10.3	11.7
Dubuque, Iowa	6.1	6.0	5.7	5.3	5.1	5.2	4.8	5.1	6.0	6.8	7.7	8.3	8.4	8.9	9.0	8.7	8.1	6.7	5.0	4.9	5.1	5.2	5.9	6.1	6.4
Duluth, Minn	9.3	8.3	8.0	8.8	9.2	8.8	9.0	9.2	9.5	10.0	11.5	11.6	12.1	12.7	12.7	13.2	12.8	11.7	11.6	10.7	9.7	9.9	9.3	8.6	10.4
Eastport, Me	9.7	9.9	9.9	9.8	9.6	10.0	10.0	10.0	10.8	10.6	10.1	10.9	10.6	10.5	10.3	10.3	9.7	9.5	9.3	9.6	9.6	9.9	10.0	9.1	10.0
Elkins, W. Va	1.5	1.5	1.4	1.2	1.3	1.5	1.5	1.6	1.8	3.1	3.5	4.4	5.4	5.8	6.1	5.4	5.1	3.6	3.1	2.5	2.3	2.0	2.0	2.0	2.9
El Paso, Tex	8.4	8.5	8.4	8.7	8.4	7.9	7.4	8.0	8.3	8.5	8.8	9.8	10.3	10.4	12.0	12.8	13.2	12.3	12.5	10.6	9.2	9.2	8.8	8.5	9.6
Erie, Pa	10.1	10.4	10.0	10.1	9.9	9.8	9.6	9.3	9.3	9.5	9.9	9.7	10.3	9.5	9.2	8.4	7.6	7.4	7.6	8.6	10.3	11.1	11.1	10.7	9.6
Escanaba, Mich	7.7	7.8	8.5	8.3	7.9	7.7	7.8	8.1	8.4	8.7	9.7	10.3	10.8	10.5	11.2	10.8	11.4	10.7	10.2	10.2	9.7	9.6	9.0	8.8	9.3
Eureka, Cal	5.9	4.8	4.9	5.1	5.6	6.0	5.2	4.5	4.2	4.0	4.1	3.6	5.3	6.1	6.7	8.2	9.1	9.6	9.2	7.7	6.7	6.2	6.0	5.3	6.0
Evansville, Ind	4.0	4.8	4.3	4.1	4.8	4.4	4.7	4.4	5.3	5.7	6.6	6.8	7.4	7.7	7.8	7.7	7.2	5.8	4.0	4.0	4.9	5.0	5.1	4.5	5.5
Fort Smith, Ark	6.2	6.1	6.6	6.4	6.3	5.6	6.4	6.3	6.5	7.0	6.9	6.9	6.8	7.3	7.7	7.7	8.0	7.9	6.7	7.3	6.7	6.4	6.0	5.9	6.7
Fort Worth, Tex	9.7	8.5	8.0	7.6	7.4	7.3	6.8	6.3	6.6	8.4	9.7	10.8	11.5	11.1	11.4	11.2	10.8	10.1	9.0	9.0	9.7	10.0	10.2	10.0	9.2
Fresno, Cal	3.7	3.7	3.7	3.7	3.2	3.3	3.5	3.6	3.6	3.6	3.8	4.3	4.6	4.6	4.5	4.6	4.5	4.5	4.7	4.5	3.9	3.9	4.0	3.9	4.0
Galveston, Tex	6.6	6.3	6.6	6.6	6.8	6.9	6.9	7.3	7.6	7.8	8.1	8.3	8.2	8.4	8.4	8.2	7.9	7.7	6.7	6.5	7.1	7.1	7.0	7.0	7.3
Grand Haven, Mich	6.5	6.4	6.2	6.3	6.5	6.3	6.6	6.4	7.0	7.9	8.9	9.1	9.7	9.7	10.0	10.0	8.9	7.4	7.0	6.8	6.6	6.8	6.6	7.0	7.5
Grand Junction, Colo	3.9	4.2	4.5	4.5	4.7	4.6	4.6	4.8	4.5	4.5	6.0	8.0	7.7	6.2	6.2	7.1	7.0	8.1	6.7	4.6	3.8	4.1	4.2	4.0	5.4
Green Bay, Wis	6.7	7.0	6.2	6.5	6.7	6.8	6.3	7.0	7.2	7.7	8.3	8.7	9.7	10.5	9.8	9.2	8.4	7.7	6.5	6.5	6.7	6.5	7.3	6.8	7.5
Harrisburg, Pa	5.3	5.5	5.4	5.1	5.1	5.0	4.8	5.6	6.1	6.9	6.9	7.3	7.7	7.7	7.9	7.7	7.2	6.3	6.0	5.7	5.4	5.5	5.5	5.3	6.1
Hatteras, N. C	11.7	12.5	12.4	12.4	12.1	12.0	11.7	12.8	13.4	13.2	13.2	14.0	14.5	14.3	14.0	13.4	13.0	12.0	11.8	11.6	11.8	11.7	10.7	10.8	12.5
Havre, Mont	7.8	8.1	8.5	8.8	9.1	9.4	9.1	9.3	8.7	9.4	10.6	11.2	12.7	13.7	13.9	14.1	14.1	12.6	11.1	8.8	8.4	9.0	8.4	7.9	10.2
Helena, Mont	6.6	6.5	6.6	6.3	5.6	5.9	6.1	5.2	5.1	4.6	4.9	5.4	6.0	7.1	8.7	9.5	9.8	9.4	8.2	7.1	7.5	7.6	7.5	7.1	6.9
Huron, S. Dak	8.8	8.7	8.9	9.0	9.8	9.6	9.1	9.4	9.9	11.3	12.5	12.9	13.5	14.6	14.7	14.4	13.6	12.2	9.5	9.0	9.8	9.6	9.7	9.5	10.8
Independence, Cal	7.3	6.4	6.3	6.0	6.2	6.6	6.9	6.7	6.2	6.4	6.9	7.9	9.0	8.3	8.9	9.7	10.8	11.2	11.7	10.2	8.6	9.1	8.2	7.4	8.0
Indianapolis, Ind	7.3	7.2	7.0	7.2	7.3	6.6	7.0	7.0	7.1	8.2	9.2	9.5	10.2	10.4	10.5	10.1	9.8	8.4	7.6	7.5	7.6	8.4	8.4	7.8	8.2
Jacksonville, Fla	5.4	5.6	5.5	5.1	5.5	5.3	4.9	5.4	6.5	8.0	9.4	9.9	10.6	10.5	11.2	10.8	9.9	7.8	6.6	6.4	6.1	5.9	6.2	5.5	7.3
Jupiter, Fla	11.5	11.9	11.2	10.4	10.8	11.4	10.9	10.9	11.8	12.1	12.8	12.8	12.6	13.0	13.4	13.1	12.7	13.1	12.6	12.6	12.4	11.0	11.8	12.2	12.0
Kalispell, Mont	4.5	4.9	4.5	4.8	4.6	4.2	4.6	5.0	5.4	5.3	4.7	4.0	4.5	5.2	6.3	7.5	8.3	8.5	7.3	5.8	5.4	5.3	4.5	4.9	5.4
Kansas City, Mo	6.9	7.1	6.9	7.4	7.0	6.6	6.4	7.1	7.1	7.8	8.3	8.9	9.2	9.2	9.2	9.6	9.4	8.3	7.1	7.1	7.2	7.3	7.1	7.1	7.7
Keokuk, Iowa	5.3	4.7	5.1	4.7	4.8	5.1	4.9	4.9	5.3	5.9	6.4	7.5	8.3	8.3	7.8	7.6	6.9	5.5	4.7	5.0	5.8	6.0	6.0	5.7	5.9
Key West, Fla	8.3	8.1	7.8	8.0	8.4	7.9	8.7	8.4	9.4	9.7	9.8	9.8	10.5	9.8	9.5	8.7	8.5	8.3	8.7	8.9	8.4	8.4	8.4	8.0	8.8
Kittyhawk, N. C	13.1	13.3	13.2	13.5	13.7	13.7	13.9	14.3	15.3	15.4	15.7	16.0	15.9	16.7	16.5	16.7	16.8	16.3	14.9	14.5	13.6	13.9	13.9	13.8	14.8
Knoxville, Tenn	3.9	4.2	4.1	3.9	4.4	4.7	4.5	4.9	5.9	5.9	5.9	6.2	6.8	6.8	7.3	7.8	7.5	6.6	5.3	4.8	4.7	3.9	4.6	4.6	5.4
La Crosse, Wis	6.5	6.1	6.1	5.8	6.0	6.0	6.5	7.2	7.0	7.4	7.2	7.7	8.2	8.5	8.1	7.9	7.9	6.7	6.7	6.3	6.7	6.4	6.6	6.8	6.9
Lander, Wyo	3.8	3.6	2.9	2.1	2.1	2.3	2.7	2.6	2.5	3.1	3.5	4.5	5.3	5.6	6.2	6.3	6.3	5.9	4.8	4.2	4.0	4.5	4.1	3.8	4.0
Lexington, Ky	7.8	7.4	7.6	7.4	7.2	7.3	7.7	7.4	7.3	8.1	8.8	9.2	9.2	9.2	9.0	9.1	9.1	8.0	7.7	8.1	8.4	7.9	7.8	7.8	8.1
Little Rock, Ark	4.1	4.3	4.6	4.6	4.7	5.0	4.6	5.2	4.8	5.6	6.0	6.2	6.6	6.8	6.6	6.6	6.5	6.1	5.5	4.6	4.4	4.5	4.7	4.2	5.3
Los Angeles, Cal	2.5	2.7	2.8	2.5	2.3	2.4	2.4	2.3	2.8	2.7	3.1	3.7	4.3	4.6	4.9	5.6	7.2	8.1	8.6	7.3	5.5	4.0	3.1	2.6	4.1
Louisville, Ky	5.2	4.9	4.7	5.1	5.0	4.7	4.8	4.4	5.1	6.0	6.3	7.8	8.8	8.3	9.0	9.2	8.5	7.4	6.9	6.9	6.3	5.8	5.2	5.3	6.3
Lynchburg, Va	2.0	1.9	2.0	1.7	1.7	1.7	1.9	2.1	2.6	3.5	4.4	4.6	4.8	4.3	4.6	4.9	4.2	3.0	2.2	2.1	2.0	2.2	2.1	2.2	2.9
Macon, Ga	4.5	5.0	5.0	4.9	5.1	5.1	5.5	5.6	6.4	6.7	7.5	8.0	8.1	8.4	8.3	7.7	7.2	6.1	5.5	5.2	5.4	5.3	5.2	4.7	6.1
Marquette, Mich	10.0	10.7	10.4	10.6	11.0	11.1	10.7	10.8	10.2	10.6	11.6	12.5	13.5	13.7	13.4	13.0	11.2	9.8	8.9	10.5	12.2	13.5	12.7	11.3	11.4
Memphis, Tenn	7.5	7.8	7.7	7.8	7.9	7.5	7.2	7.4	8.3	8.5	8.6	8.2	8.6	8.4	9.1	9.2	7.9	7.6	7.1	7.4	8.1	8.2	8.2	7.4	8.0
Milwaukee, Wis	9.1	9.4	9.1	9.0	8.5	8.3	8.3	8.0	8.4	8.8	9.4	9.8	12.0	12.8	12.8	12.4	12.2	10.3	9.4	9.7	9.6	8.9	9.3	9.3	9.8
Mobile, Ala	5.5	5.6	5.7	5.8	5.9	5.9	6.3	6.8	6.8	7.6	7.6	7.6	7.6	8.1	8.6	8.8	8.7	7.6	7.2	6.5	6.0	6.3	6.1	5.7	6.9
Montgomery, Ala	5.4	5.3	5.8	5.5	5.2	5.1	5.2	5.5	6.6	7.5	7.6	7.6	8.0	8.5	7.9	8.2	7.7	6.3	5.5	5.7	5.5	5.3	5.6	5.5	6.3
Moorhead, Minn	8.5	8.9	8.5	8.9	8.7	8.0	8.4	8.6	8.3	9.0	11.1	11.8	12.5	12.7	11.9	11.7	11.1	10.0	8.2	8.0	8.4	8.2	8.0	8.3	9.5
Mount Tamalpais, Cal	19.2	19.2	19.4	19.2	20.1	19.8	20.9	20.7	21.8	21.7	20.3	17.9	16.5	15.6	14.2	14.1	15.0	15.1	15.0	17.5	17.0	17.3	18.0	18.3	18.1
Nantucket, Mass	11.9	12.1	12.2	12.2	12.0	11.9	12.0	12.3	13.0	14.0	13.9	13.8	13.8	14.3	14.2	13.3	12.7	12.6	11.8	12.6	12.3	11.9	12.2	12.3	12.7
Nashville, Tenn	4.1	4.1	3.8	4.1	3.8	4.4	4.1	4.4	4.9	6.0	7.2	8.3	8.3	8.5	8.8	8.5	8.1	7.3	5.8	5.7	5.4	5.0	4.7	4.6	5.8
Neah Bay, Wash	7.0	6.9	6.5	6.1	5.7	6.2	5.5	5.7	5.4	5.4	5.6	5.8	6.2	6.6	6.5	7.2	7.4	7.1	7.2	6.7	6.3	6.4	6.2	6.3	6.3
New Haven, Conn	7.9	8.1	8.1	8.4	8.8	8.7	8.6	8.8	10.2	10.8	10.7	10.2	10.3	10.6	11.1	10.1	9.9	8.3	7.5	8.2	7.8	8.0	8.3	8.0	9.0
New Orleans, La	6.2	6.2	6.0	6.2	5.7	5.9	6.7	6.7	7.2	8.2	8.1	8.5	9.4	9.2	8.7	8.6	8.1	7.4	6.3	5.9	5.8	5.9	5.9	6.1	7.0

TABLE V.—*Average wind movement, etc.*—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
New York, N. Y	12.4	12.3	12.0	11.6	11.3	10.5	10.4	11.1	11.9	11.6	11.9	11.9	12.5	12.3	12.6	13.4	14.0	13.5	13.7	14.8	15.2	14.6	13.5	12.4	12.9
Norfolk, Va	7.2	7.4	7.1	7.6	7.8	7.7	7.4	8.2	9.3	10.1	10.1	10.4	10.3	10.3	10.1	10.2	9.6	8.5	8.3	7.5	7.5	7.6	7.3	7.6	8.6
Northfield, Vt	6.5	6.3	6.6	6.7	6.6	6.7	6.4	7.1	7.5	8.5	9.4	9.6	10.2	11.4	11.0	9.6	8.3	8.5	8.0	8.5	8.5	8.3	7.6	7.7	8.2
North Platte, Nebr	8.1	7.2	6.5	7.2	7.3	6.5	6.4	6.8	6.2	6.9	7.7	7.6	9.4	10.5	10.9	10.9	11.5	10.5	9.2	8.2	7.8	7.8	8.5	8.3	8.2
Oklahoma, Okla	7.9	8.4	8.1	8.0	8.0	8.1	7.9	8.0	8.5	9.6	11.4	12.4	12.7	12.7	12.6	11.8	11.5	10.5	8.2	7.9	8.2	8.0	7.4	7.1	9.4
Omaha, Nebr	7.6	7.1	6.5	6.5	6.3	6.3	6.4	6.3	6.8	7.4	8.7	9.4	10.1	9.8	9.8	9.4	9.4	8.5	8.0	7.5	7.9	7.7	7.5	7.5	7.8
Oswego, N. Y	9.5	9.4	9.3	9.5	9.1	8.9	9.5	9.6	9.8	10.3	10.6	10.3	10.8	10.9	10.5	9.5	8.8	8.0	8.6	8.8	9.5	10.0	9.9	9.3	9.6
Palestine, Tex	5.8	5.9	5.9	5.6	5.5	5.2	5.0	4.4	4.6	5.4	6.5	6.6	7.3	7.5	7.8	7.9	7.6	7.0	5.5	5.1	5.5	5.5	5.8	6.0	6.0
Parkersburg, W. Va	2.9	2.7	2.5	2.6	2.4	2.1	1.8	2.1	2.9	4.0	4.7	5.4	6.1	6.6	6.6	6.8	6.2	4.8	3.9	4.0	4.2	4.1	3.6	3.3	4.0
Pensacola, Fla	9.0	9.2	8.9	9.0	9.1	9.0	9.5	10.2	9.9	10.4	10.4	10.5	10.0	10.2	10.5	10.5	9.4	8.9	8.1	8.1	8.3	8.9	9.3	9.4	9.4
Phoenix, Ariz	2.8	3.0	3.0	2.9	3.2	2.9	3.5	3.7	3.3	3.4	4.4	5.4	5.4	5.3	5.8	5.3	4.9	4.6	4.3	3.2	3.3	3.0	2.9	3.0	3.8
Philadelphia, Pa	8.4	8.0	8.0	8.2	8.0	8.1	8.5	9.0	9.5	9.4	9.9	9.6	10.1	9.9	9.9	9.9	9.5	8.6	9.4	9.4	8.8	8.5	8.7	8.6	9.0
Pierre, S. Dak	8.5	7.9	6.8	7.0	7.3	7.2	7.8	7.8	7.4	8.3	9.2	10.2	10.7	11.1	12.0	12.5	12.3	11.0	8.9	8.5	8.4	9.0	7.6	8.3	9.0
Pittsburg, Pa	3.5	3.6	3.4	3.2	3.3	3.6	3.6	3.6	4.3	4.8	5.3	5.7	6.4	6.5	6.5	6.9	6.7	6.5	6.3	5.6	5.1	4.4	3.9	3.6	4.8
Pocatello, Idaho	13.2	12.9	13.3	12.8	11.8	11.6	11.3	11.9	11.6	11.0	12.3	11.2	11.2	11.1	11.5	12.2	12.1	11.9	11.4	10.2	10.1	11.0	11.9	12.6	11.8
Point Reyes Lt., Cal	19.0	18.2	18.2	17.5	17.2	16.6	16.9	16.8	15.8	15.8	15.2	13.1	13.1	13.6	14.0	14.8	16.1	17.3	19.4	20.3	20.3	20.4	20.2	19.7	17.1
Port Crescent, Wash	2.6	2.7	2.7	2.5	2.9	3.3	3.1	2.9	2.9	2.8	2.6	2.8	3.6	4.9	5.2	5.5	5.2	4.7	4.0	3.7	3.0	2.8	3.1	2.6	3.4
Port Huron, Mich	8.1	8.0	7.9	8.4	8.1	8.3	8.9	8.9	8.4	9.1	9.6	10.7	11.3	11.5	10.9	10.7	9.5	8.3	8.8	9.2	9.0	9.3	9.1	8.7	9.2
Portland, Me	6.2	5.8	5.9	6.2	6.5	6.5	6.5	6.8	7.3	7.4	7.7	7.9	7.9	8.7	8.2	8.2	7.0	7.5	6.9	6.9	7.1	6.9	6.8	6.4	7.0
Portland, Oreg	7.8	8.0	8.7	8.6	8.5	8.7	8.8	9.3	9.4	9.4	8.8	8.8	9.8	10.3	10.7	11.3	11.5	11.8	11.0	11.2	9.6	9.3	8.7	8.1	9.5
Pueblo, Colo	6.5	5.5	4.9	4.9	5.4	5.2	4.2	4.2	4.0	4.0	4.8	6.3	5.9	5.7	5.5	6.7	7.3	8.2	8.3	7.5	5.6	5.5	5.4	5.8	5.7
Raleigh, N. C	4.6	4.5	4.9	5.1	4.7	4.5	4.7	5.0	5.5	6.6	7.0	7.3	7.3	6.9	7.3	6.6	6.0	4.9	4.6	4.7	4.4	4.7	4.5	4.7	5.4
Rapid City, S. Dak	6.3	6.4	6.9	7.0	7.1	7.5	7.5	8.3	8.4	7.7	8.0	8.3	9.6	11.2	10.8	10.7	10.8	10.5	7.8	6.3	6.1	6.0	6.4	6.6	8.0
Red Bluff, Cal	6.2	6.3	6.6	5.9	5.8	5.8	5.8	6.4	6.1	6.3	6.5	7.4	8.4	8.4	8.0	7.9	7.4	6.8	6.8	6.2	5.6	5.6	5.2	6.2	6.6
Richmond, Va	3.7	3.7	3.7	3.7	3.8	3.7	3.7	4.3	4.8	5.4	5.4	5.3	5.6	5.1	5.2	4.9	4.5	3.7	3.5	3.2	3.8	3.9	3.6	3.8	4.2
Rochester, N. Y	5.6	5.6	5.9	6.3	5.8	5.9	5.6	6.3	6.9	7.3	7.5	7.5	7.9	7.5	8.0	7.9	7.0	5.9	5.6	5.4	5.7	5.7	6.0	6.2	6.5
Roseburg, Oreg	2.5	2.5	2.1	2.2	2.5	2.4	1.9	2.2	2.1	2.6	2.9	2.9	3.7	4.2	4.7	5.2	6.1	6.2	6.1	5.6	3.9	2.6	2.7	2.4	3.4
Sacramento, Cal	8.0	7.4	7.2	8.0	7.7	7.1	6.8	7.0	7.0	7.3	7.0	6.7	8.3	9.0	9.5	9.3	8.9	8.6	8.1	7.2	7.1	7.4	7.5	7.5	7.7
St. Louis, Mo	6.4	6.7	6.3	6.4	5.7	5.5	5.6	6.0	6.4	6.9	7.7	8.2	8.7	8.8	9.2	8.8	8.9	8.2	7.6	7.4	6.8	7.5	7.3	7.5	7.3
St. Paul, Minn	6.6	7.0	6.9	7.1	6.8	6.6	6.8	6.5	6.9	7.3	8.6	9.3	10.3	10.5	11.0	10.3	9.9	8.9	8.1	8.0	8.3	7.6	7.2	7.3	8.1
Salt Lake City, Utah	5.3	4.9	5.4	5.2	5.4	5.3	4.9	5.5	5.3	5.2	4.9	5.6	7.3	8.5	9.2	9.4	9.9	10.4	10.2	7.4	5.5	4.9	5.4	5.1	6.5
San Antonio, Tex	4.6	4.2	4.4	4.2	3.9	3.8	3.5	3.6	3.5	4.8	6.1	6.7	6.6	6.8	7.3	7.1	6.8	7.6	6.6	5.5	5.8	6.1	5.9	5.1	5.4
San Diego, Cal	2.8	3.2	3.1	2.8	2.8	3.1	3.3	3.0	3.4	3.6	3.4	3.9	5.5	7.2	9.0	10.3	10.4	9.9	8.7	7.5	6.0	4.2	3.1	2.6	5.1
Sandusky, Ohio	5.5	5.5	5.8	5.4	5.6	5.5	6.2	5.9	6.5	7.1	7.3	6.9	7.1	7.2	7.5	7.6	6.5	6.1	5.9	5.8	6.0	6.2	5.7	6.0	6.3
San Francisco, Cal	7.6	7.8	7.2	6.7	6.1	5.9	5.8	6.2	6.1	6.4	7.6	8.0	8.5	9.1	9.5	11.2	12.4	13.5	13.9	15.1	13.3	12.1	9.7	8.3	9.1
San Luis Obispo, Cal	3.1	3.4	3.4	4.1	4.1	3.8	4.3	3.8	4.5	4.2	4.1	5.0	5.9	6.0	7.1	7.9	8.8	9.2	7.8	6.7	5.6	4.5	3.2	3.1	5.1
Santa Fe, N. Mex	5.2	5.1	4.5	3.7	3.4	3.4	3.5	3.8	4.2	4.0	5.4	6.3	7.1	8.4	8.4	8.1	8.3	8.5	7.2	5.3	5.4	5.8	6.2	6.2	5.7
Sault Ste. Marie, Mich	6.1	6.1	5.9	6.2	5.9	6.0	6.2	6.1	6.3	7.2	8.4	8.5	9.6	10.1	10.2	10.1	9.6	8.6	8.0	7.4	6.9	7.1	6.6	6.5	7.5
Savannah, Ga	5.2	5.3	5.5	5.3	5.5	5.8	5.5	6.2	7.2	8.0	9.2	10.0	10.6	9.7	9.7	9.7	9.2	7.9	6.6	6.1	5.5	5.5	5.2	5.6	7.1
Seattle, Wash	5.3	5.3	5.2	5.7	5.5	5.2	5.7	5.9	6.0	6.2	6.2	6.3	6.5	7.2	7.6	7.8	7.6	8.2	8.5	7.6	7.3	7.4	7.5	6.3	6.6
Shreveport, La	4.9	5.2	4.9	4.4	4.4	4.7	4.5	4.3	4.9	6.2	5.7	5.9	6.2	5.7	6.4	6.8	6.8	6.7	6.4	5.6	5.5	5.6	5.5	4.9	5.5
Sioux City, Iowa	12.1	12.0	10.8	9.7	10.0	9.7	10.0	10.4	10.3	11.2	13.1	14.3	15.4	15.8	17.0	17.9	16.8	15.3	14.2	13.6	13.0	12.9	12.2	12.1	12.9
Spokane, Wash	5.1	5.6	6.0	5.8	5.9	5.8	5.5	5.7	5.9	6.8	6.5	7.4	8.2	8.5	8.5	8.4	8.5	8.1	7.5	7.0	6.0	5.5	5.0	5.2	6.6
Springfield, Ill	6.9	7.0	6.6	6.6	6.4	6.4	6.3	6.5	7.0	7.7	8.5	9.0	9.6	9.9	9.6	9.2	9.1	7.7	6.7	6.8	6.7	7.1	7.3	7.2	7.6
Springfield, Mo	8.7	8.7	9.0	8.8	8.8	8.7	8.7	7.9	7.8	8.6	9.3	9.3	9.4	9.3	9.5	9.6	9.7	9.2	8.3	8.4	9.1	9.5	9.7	9.2	9.0
Tacoma, Wash	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Tampa, Fla	4.7	4.9	4.7	4.6	4.9	4.8	5.0	6.2	7.6	8.5	9.2	8.6	8.2	8.5	8.3	7.8	7.6	6.0	6.0	5.4	5.6	5.2	5.0	4.9	6.4
Toledo, Ohio	6.7	6.9	6.4	6.4	6.3	6.5	6.6	6.5	7.3	7.9	8.5	9.3	9.9	10.1	10.8	10.3	9.2	7.5	6.7	6.9	7.0	6.8	7.7	8.1	7.8
Valentine, Nebr	7.9	8.3	8.3	7.7	7.6	7.3	7.5	7.9	7.7	8.2	10.4	11.5	11.5	12.6	12.7	12.7	11.5	11.5	9.7	8.8	7.9	8.1	8.0	7.5	9.3
Vicksburg, Miss	4.4	4.4	4.5	4.1	3.9	4.0	4.4	4.7	5.0	5.0	5.5	5.1	5.4	5.8	5.5	5.5	5.5	4.8	4.2	4.0	3.9	4.3	4.8	4.8	4.7
Walla Walla, Wash	5.4	5.8	5.9	6.2	5.8	6.2	5.5	5.5	5.9	6.2	6.2	6.5	7.0	7.3	7.4	7.2	6.8	6.2	6.1	5.4	5.4	5.9	5.5	5.7	6.1
Washington, D. C	4.3	4.1	4.1	4.0	4.3	4.6	4.8	5.0	6.1	6.8	7.2	7.6	7.9	7.9	8.0	7.5	6.5	5.5	4.8	4.9	5.0	5.1	4.9	4.4	5.6
Wichita, Kans.*	7.7	7.2	7.0	6.9	7.5	7.7	7.4	7.3	7.6	8.3	8.8	9.7	9.6	10.5	10.8	10.3	10.2	8.6	6.7	6.2	6.6	7.0	7.8	8.2	8.1
Williston, N. Dak	5.1	5.5	5.3	5.5	5.3	5.0	5.3	5.4	5.6	5.7	6.8	7.4	9.9	9.9	11.0	11.2	11.3	9.8	7.2	5.9	5.5	5.5	5.1	5.3	6.9
Wilmington, N. C	6.4	6.4	6.2	5.9	6.1	6.6	7.3	7.6	8.2	8.9	9.5	10.1	10.0	9.7	10.1	9.2	8.6	7.0	5.9	6.0	6.4	6.4	6.4	6.5	7.6
Winnemucca, Nev	7.5	7.7	7.9	7.6	8.5	9.1	9.2	9.3	8.7	8.5	8.4	9.0	10.9	11.6	11.9	12.6	12.4	12.4	11.2	9.0	7.8	7.1	6.9	7.1	9.3
Yankton, S. Dak	8.4	7.8	7.7	7.5	7.0	5.8	5.5	5.8	6.4	7.6	8.3	10.3	12.1	12.8	13.4	13.1	12.8	11.3	9.1	8.6	8.2	8.2	8.2	8.4	8.9
West Indies.																									
Basseterre, St. Kitts	7.1	7.1	6.8	6.7	6.3	6.8	7.8	9.8	10.3	10.4	10.3	9.9	9.8	9.3	8.6	8.3	7.1	6.5	6.4	7.3	7.4	7.4	7.4	7.1	8.0
Bridgetown, Bar	4.7	4.6	4.8	5.0	5.5	5.0	7.0	10.7	11.8	11.4	11.7	11.4	11.6	10.7	9.7	8.4	6.5	5.4	5.5	5.0	5.5	5.4	5.5	5.0	7.4
Cienfuegos, Cuba	4.4	4.5	4.4	4.5	4.4	4.6	4.2	4.2	4.7	5.5	6.0	6.3	7.4	8.0	9.0	8.2	7.6	6.4	5.0	4.5	4.8	4.3	4.5	4.9	5.5
Havana, Cuba	6.4	6.2	5.7	5.5	5.5	6.0	5.7	5.6	7.8	10.0	11.5	11.3	12.1	13.3	14.2	13.7	12.6	10.8	8.7	8.7	7.5	7.0	6.8	6.6	8.7
Kingston, Jamaica	4.4	4.5	4.7	4.6	4.9	5.0	4.6	3.6	2.9	3.5	5.0	6.9	9.4	8.5	7.6	6.5	4.9	3.7	3.7	4.2	4.3	4.3	4.5	4.4	5.0
Port of Spain, Trin	1.9	2.1	2.2	2.4	2.1	2.1	2.5	4.8	6.6	7.3	7.4	7.0	7.0	6.6	6.3	5.4	4.6	3.6	3.4	2.8	3.0	3.0	2.4	2.5	4.1
Puerto Principe, Cuba	2.6	2.6	2.4	2.7	2.7	2.8	3.0	3.9	7.3	8.7	8.1	8.0	7.9	8.1	7.9	8.2	8.3	6.3	4.3	4.1	3.7	3.5	3.4	3.2	5.1
Roseau, Dominica	4.1	4.3	4.0	4.1	4.3	4.0	3.5	3.7	4.8	5.8	6.7	6.8	6.5	6.3	6.0	4.9	4.0	4.2	4.5	4.0	3.8	4.4	4.1	4.0	4.7
San Juan, Porto Rico	5.7	5.8	5.5	5.2	4.8	4.7	5.0	5.6	7.4	9.2	11.7	13.5	14.3	14.9	14.0	13.2	11.4	10.1	8.6	7.2	5.9	5.9	6.3	5.5	8.4
Santiago de Cuba	1.3	1.8	1.9	1.8	1.8	1.6	1.7	2.2	2.6	3.6	4.5	5.3	5.8	5.3	5.3	4.8	4.2	2.5	1.9	1.9	2.1	1.5	1.6	1.5	2.9
Santo Domingo, S. D.	3.8	4.3	4.3	4.3	4.6	4.7	4.6	5.1	4.8	4.8	4.8	5.4	5.5	6.3	5.8	5.4	4.3	4.1	3.8	3.8	4.0	3.5	4.0	4.1	4.6
Willemstad, Curaçao	8.2	7.9	7.9	7.7	7.7	8.0	8.5	11.1	12.0	12.3	12.7	12.5	12.2	12.7	12.9	13.0	12.9	12.1	11.2	11.0	10.5	9.9	9.5	8.9	10.6

TABLE VI.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of October, 1900.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	22	18	14	13	n. 6 e.	9
Portland, Me	28	14	15	24	n. 33 w.	17
Northfield, Vt	20	39	3	5	s. 2 w.	19
Boston, Mass	28	15	14	21	n. 28 w.	15
Nantucket, Mass	23	9	21	22	n. 60 w.	30
Block Island, R. I	22	12	25	21	n. 22 e.	11
New Haven, Conn	32	11	15	18	n. 8 w.	21
Middle Atlantic States.						
Albany, N. Y	24	30	4	12	s. 53 w.	10
Binghamton, N. Y.†	13	9	5	9	n. 45 w.	6
New York, N. Y	21	17	19	18	n. 14 e.	4
Harrisburg, Pa.†	10	7	12	8	n. 53 e.	5
Philadelphia, Pa	25	13	20	18	n. 9 e.	12
Scranton, Pa	25	16	21	16	n. 29 e.	10
Atlantic City, N. J	21	14	15	19	n. 30 w.	8
Cape May, N. J.	24	16	17	16	n. 7 e.	8
Baltimore, Md	23	13	26	12	n. 54 e.	17
Washington, D. C	23	14	23	15	n. 42 e.	12
Lynchburg, Va	23	13	25	13	n. 50 e.	16
Norfolk, Va	26	13	28	8	n. 57 e.	24
Richmond, Va	27	21	18	9	n. 56 e.	11
South Atlantic States.						
Charlotte, N. C	31	12	33	4	n. 57 e.	35
Hatteras, N. C	35	9	26	9	n. 33 e.	31
Raleigh, N. C	26	12	18	11	n. 27 e.	16
Wilmington, N. C	33	9	26	9	n. 35 e.	29
Charleston, S. C	34	7	34	2	n. 50 e.	42
Augusta, Ga	28	10	37	3	n. 62 e.	38
Savannah, Ga	35	9	28	2	n. 45 e.	37
Jacksonville, Fla	33	9	31	1	n. 54 e.	31
Florida Peninsula.						
Jupiter, Fla	24	6	41	5	n. 63 e.	40
Key West, Fla	27	11	31	7	n. 56 e.	29
Tampa, Fla	36	2	29	6	n. 34 e.	41
Eastern Gulf States.						
Atlanta, Ga	20	9	39	8	n. 70 e.	33
Macon, Ga†	19	2	13	3	n. 30 e.	20
Pensacola, Fla.†	17	4	15	2	n. 45 e.	18
Mobile, Ala	38	10	16	6	n. 20 e.	30
Montgomery, Ala	28	4	40	2	n. 58 e.	45
Meridian, Miss.†	15	7	12	2	n. 51 e.	13
Vicksburg, Miss	23	15	33	4	n. 73 e.	30
New Orleans, La	31	10	30	9	n. 45 e.	30
Western Gulf States.						
Shreveport, La	23	18	26	2	n. 70 e.	15
Fort Smith, Ark	21	8	36	6	n. 67 e.	33
Little Rock, Ark	22	19	18	15	n. 45 e.	4
Corpus Christi, Tex	13	21	31	12	s. 65 e.	21
Fort Worth, Tex†	7	14	7	9	s. 16 w.	7
Galveston, Tex	20	14	34	8	n. 77 e.	27
Palestine, Tex	21	24	20	9	s. 75 e.	11
San Antonio, Tex	23	17	31	7	n. 76 e.	25
Ohio Valley and Tennessee.						
Chattanooga, Tenn	25	18	19	18	n. 8 e.	7
Knoxville, Tenn	34	9	24	10	n. 29 e.	29
Memphis, Tenn	21	17	22	10	n. 72 e.	13
Nashville, Tenn	25	16	20	15	n. 29 e.	10
Lexington, Ky†	6	15	16	4	s. 55 e.	16
Louisville, Ky	26	24	15	11	n. 63 e.	4
Evansville, Ind.†	11	10	16	2	n. 86 e.	14
Indianapolis, Ind	21	22	19	12	s. 82 e.	7
Cincinnati, Ohio	16	23	31	9	s. 72 e.	23
Columbus, Ohio	18	23	27	11	s. 73 e.	16
Pittsburg, Pa	23	17	22	14	n. 53 e.	10
Parkersburg, W. Va	18	24	23	10	s. 65 e	14
Elkins, W. Va	26	20	16	15	n. 9 e.	6
Lower Lake Region.						
Buffalo, N. Y	10	24	18	22	s. 16 w.	15
Oswego, N. Y	10	32	26	8	s. 39 e.	28
Rochester, N. Y	13	27	16	26	s. 36 w.	17
Erie, Pa	7	31	16	15	s. 2 e.	24
Cleveland, Ohio	12	34	25	8	s. 38 e.	28
Sandusky, Ohio	14	29	17	20	s. 11 w.	15
Toledo, Ohio	15	26	19	15	s. 20 e.	12
Detroit, Mich	18	23	18	17	s. 11 e.	5
Upper Lake Region.						
Alpena, Mich	11	32	13	18	s. 13 w.	22
Escanaba, Mich	9	36	12	15	s. 6 w.	27
Grand Haven, Mich	12	27	26	12	s. 43 e.	20
Houghton, Mich†	2	12	16	5	s. 38 e.	18
Marquette, Mich	15	31	13	15	s. 7 w.	16
Port Huron, Mich	15	28	16	16	s.	13
Sault Ste. Marie, Mich	9	26	35	11	s. 52 e.	28
Chicago, Ill	9	32	20	16	s. 10 e.	23
Milwaukee, Wis.	7	28	10	28	s. 41 w.	28
Green Bay, Wis	10	35	20	9	s. 24 e.	27
Duluth, Minn	30	8	23	17	n. 15 e.	23
North Dakota.						
Moorhead, Minn	26	21	18	14	n. 31 e.	6
Bismarck, N. Dak	26	11	24	16	n. 28 e.	17
Williston, N. Dak	21	20	10	21	n. 85 w.	11
Upper Mississippi Valley.						
St. Paul, Minn	8	34	26	14	s. 25 e.	29

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
Upper Mississippi Valley.—Con'd.	*Hours.*	*Hours.*	*Hours.*	*Hours*	°	*Hours.*
La Crosse, Wis. †	7	17	11	5	s. 31 e.	12
Davenport, Iowa	5	32	27	11	s. 31 e.	31
Des Moines, Iowa	12	34	12	17	s. 13 w.	23
Dubuque, Iowa	7	36	21	12	s. 17 e.	30
Keokuk, Iowa	5	37	19	13	s. 11 e.	33
Cairo, Ill	23	23	21	9	e.	12
Springfield, Ill	10	35	21	9	s. 26 e.	28
Hannibal, Mo†	4	16	8	9	s. 5 w.	12
St. Louis, Mo	20	30	15	5	s. 45 e.	14
Missouri Valley.						
Columbia, Mo.*	2	14	13	7	s. 27 e.	13
Kansas City, Mo	10	36	24	8	s. 32 e.	30
Springfield, Mo	13	32	25	5	s. 46 e.	28
Lincoln, Nebr	15	32	31	6	s. 56 e.	30
Omaha, Nebr	11	32	25	6	s. 42 e.	28
Valentine, Nebr	24	19	7	26	n. 75 w	20
Sioux City, Iowa†	5	17	15	4	s. 43 e.	16
Pierre, S. Dak	28	14	22	16	n. 23 e.	15
Huron, S. Dak	19	19	21	18	e.	3
Yankton, S. Dak†	5	10	9	11	s. 22 w.	5
Northern Slope.						
Havre, Mont	13	22	10	35	s. 70 w.	27
Miles City, Mont	23	19	16	20	n. 45 w.	6
Helena, Mont	11	28	4	38	s. 63 w.	38
Kalispell, Mont	17	20	10	33	s. 83 w.	23
Rapid City, S. Dak	25	12	12	26	n. 47 w.	19
Cheyenne, Wyo	27	14	4	32	n. 65 w.	31
Lander, Wyo	13	29	10	30	s. 51 w.	26
North Platte, Nebr	15	18	13	27	s. 78 w.	14
Middle Slope.						
Denver, Colo	16	30	13	16	s. 12 w.	14
Pueblo, Colo	18	13	20	22	n. 22 w.	5
Concordia, Kans	14	38	7	9	s. 5 w.	24
Dodge, Kans	14	33	13	11	s. 2 e.	19
Wichita, Kans	12	44	9	4	s. 9 e.	32
Oklahoma, Okla	17	33	19	6	s. 39 e.	21
Southern Slope.						
Abilene, Tex	12	33	25	9	s. 37 e.	26
Amarillo, Tex	9	40	15	15	s.	31
Southern Plateau.						
El Paso, Tex	19	9	22	27	n. 24 w.	11
Santa Fe, N. Mex	20	23	27	9	s. 81 e.	18
Flagstaff, Ariz	18	19	16	24	s. 83 w.	8
Phoenix, Ariz	13	8	9	19	n. 63 w.	11
Yuma, Ariz.‡	17	9	14	12	n. 14 e.	8
Independence, Cal	21	22	16	25	s. 84 w.	9
Middle Plateau.						
Carson City, Nev	11	26	9	32	s. 57 w.	28
Winnemucca, Nev	20	19	14	20	n. 80 w.	6
Cedar City, Utah	15	24	15	11	s. 24 e.	10
Salt Lake City, Utah.	15	29	17	16	s. 4 e.	14
Grand Junction, Colo	20	21	20	19	s. 45 e.	1
Northern Plateau.						
Baker City, Oreg	10	41	9	15	s. 11 w.	32
Boise, Idaho	19	16	19	24	n. 59 w.	6
Lewiston, Idaho†	3	8	18	4	s. 70 e.	15
Pocatello, Idaho	6	32	9	20	s. 39 w.	33
Spokane, Wash	18	28	21	9	s. 50 e.	16
Walla Walla, Wash	5	39	13	15	s. 3 w.	34
North Pacific Coast Region.						
Neah Bay, Wash	5	13	25	27	s. 14 w.	8
Port Crescent, Wash*	1	8	13	10	s. 23 e.	8
Seattle, Wash	11	41	20	13	s. 13 e.	31
Tacoma, Wash	12	31	5	31	s. 54 w.	32
Astoria, Oreg	9	29	23	24	s. 3 w.	20
Portland, Oreg	13	34	7	24	s. 39 w.	17
Roseburg, Oreg	18	19	17	21	s. 76 w.	4
Middle Pacific Coast Region.						
Eureka, Cal	18	24	17	21	s. 34 w.	7
Mount Tamalpais, Cal	20	14	6	34	n. 78 w.	29
Red Bluff, Cal	33	18	16	10	n. 22 e.	16
Sacramento, Cal	21	30	17	11	s. 34 e.	11
San Francisco, Cal	5	14	4	45	s. 78 w.	42
South Pacific Coast Region.						
Fresno, Cal	31	9	8	34	n. 50 w.	34
Los Angeles, Cal	19	6	11	33	n. 60 w.	26
San Diego, Cal	27	7	12	30	n. 42 w.	27
San Luis Obispo, Cal	20	16	5	23	n. 77 w.	18
West Indies.						
Basseterre, St. Kitts Island	10	4	54	1	n. 84 e	53
Bridgetown, Barbados	8	11	54	0	s. 87 e.	53
Cienfuegos, Cuba	30	6	37	6	n. 52 e.	39
Havana, Cuba	18	8	42	3	n. 76 e.	40
Kingston, Jamaica	49	0	28	1	n. 29 e.	56
Port of Spain, Trinidad	8	7	51	4	n. 89 e.	47
Puerto Principe, Cuba	25	7	34	8	n. 55 e.	32
Roseau, Dominica, W. I	22	5	40	12	n. 59 e.	23
San Juan, Porto Rico	0	37	38	2	s. 44 e.	52
Santiago de Cuba, Cuba	16	30	26	8	s. 52 e.	23
Santo Domingo, S. Domingo, W. I.	49	4	8	5	n. 4 e.	45
Turks Island, W. I.†	2	16	17	3	s. 45 e.	20
Willemstad, Curaçao	3	7	58	0	s. 88 e.	58

* From observations at 8 p. m. only. † From observations at 8 a. m. only. ‡ For 21½ days.

TABLE VII.—*Thunderstorms and auroras, October, 1900.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	52	T.			1	2		6	7	1				2									1	2		1							4	27	10	T.
		A.																																0	0	A.
Arizona	56	T.						1			1		3	3	2	3		2																15	7	T.
		A.																																0	0	A.
Arkansas	57	T.						2	8			1										1	9				1	1			2	2	2	29	10	T.
		A.																																0	0	A.
California	167	T.		3	1	1							5							2					1					2				15	7	T.
		A.																																0	0	A.
Colorado	81	T.	1				2	1								2	5	1				1					1		1		5			20	10	T.
		A.																																0	0	A.
Connecticut	21	T.								5								5																10	2	T.
		A.																																0	0	A.
Delaware	5	T.								1					1																			2	2	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.																																0	0	T.
		A.																																0	0	A.
Florida	47	T.	2	3	3	3	2	1	1	3	2	3	4	3									4	3							3	1		41	16	T.
		A.																																0	0	A.
Georgia	55	T.		1	1	2	4	1	5	2			1	2	1									7	4	1	1							33	14	T.
		A.																																0	0	A.
Idaho	34	T.			1														1	3	4	1	1	1										12	7	T.
		A.																																0	0	A.
Illinois	92	T.		2				13	1															4					1	7	17		2	47	8	T.
		A.				1												1												1				3	3	A.
Indiana	58	T.	1			2		2	2								1	2						3							3	5		21	9	T.
		A.																																0	0	A.
Indian Territory	11	T.	1						1								3	1			1		7							6	1	4	3	28	10	T.
		A.																																0	0	A.
Iowa	149	T.	15	10	8	7	7	13															4	1				1	16	26	4	22	11	145	14	T.
		A.																																0	0	A.
Kansas	77	T.	5					6														3	5							5	2	18	3	47	8	T.
		A.																																0	0	A.
Kentucky	41	T.				1		1	2																				1	1		1		7	6	T.
		A.																																0	0	A.
Louisiana	46	T.		1			2	2	3	2											1	1	7	4		4	2				1	4	5	39	14	T.
		A.																																0	0	A.
Maine	19	T.					7			2								1																10	3	T.
		A.																																0	0	A.
Maryland	48	T.					2	1	3	6					7	2																		21	6	T.
		A.																																0	0	A.
Massachusetts	48	T.								3	1							1																5	3	T.
		A.																																0	0	A.
Michigan	106	T.	1	4	2	2	2					1	1	1	1	3	1		1								2		4	3	2	3	1	35	18	T.
		A.																																0	0	A.
Minnesota	67	T.	8	16	16	15	15	15									1						1					4	18	10	1	3	2	125	14	T.
		A.																									1							1	1	A.
Mississippi	41	T.				2	1	4	3				1								1		10	4		3	4	3				2	6	44	13	T.
		A.																																0	0	A.
Missouri	95	T.	18					21	3														11	1				2	3	11	8	18	10	106	11	T.
		A.																																0	0	A.
Montana	40	T.			2		4																											6	2	T.
		A.																												1				1	1	A.
Nebraska	142	T.	9	4	7	1		4									11					13	3	3				10	10	2	2	9		88	14	T.
		A.																										1						1	1	A.
Nevada	40	T.					1														2													3	2	T.
		A.																																0	0	A.
New Hampshire	19	T.					1	4		6								6																17	4	T.
		A.																																0	0	A.
New Jersey	51	T.	1				2	1		16								7																27	5	T.
		A.																																0	0	A.
New Mexico	31	T.								1							5		*1		1							1	5	1		1		16	8	T.
		A.																																0	0	A.
New York	99	T.					7	2	2	3	1							10	1	1					2			2	5			4		40	12	T.
		A.																								1								1	1	A.
North Carolina	56	T.								5															4									9	2	T.
		A.																																0	0	A.
North Dakota	48	T.					1	1																					2	1				5	4	T.
		A.																							1		1							2	2	A.
Ohio	128	T.					2	13	6	1							1	8						6	2			3	2		4	3	1	52	13	T.
		A.																																0	0	A.
Oklahoma	23	T.	1														5	1		1	1	4	3							9		12	6	43	10	T.
		A.																																0	0	A.
Oregon	74	T.	2	1	2															2	1	1		2	2				1	1				15	10	T.
		A.																																0	0	A.
Pennsylvania	91	T.					5		3	3								5				1										1	1	19	7	T.
		A.																																0	0	A.
Rhode Island	7	T.						1																										1	1	T.
		A.																																0	0	A.
South Carolina	46	T.		2	5	5	3		1	5				5								1	1	3	10	3								44	12	T.
		A.																																0	0	A.
South Dakota	56	T.	4	3	1		1	3																				2	2	1		1		18	9	T.
		A.																																0	0	A.
Tennessee	56	T.			1	1		2	5				1	3										2				1	1					17	9	T.
		A.																																0	0	A.
Texas	95	T.							2										1	1		1	5	1		3		2	1	1	4	9	17	48	15	T.
		A.																																0	0	A.
Utah	47	T.	1				4	1					2	1	2	2	1				2	1									3	1		21	12	T.
		A.																																0	0	A.
Vermont	16	T.			1			3										4																8	3	T.
		A.																																0	0	A.
Virginia	50	T.					3	1	6	5										1		1												17	6	T.
		A.																																0	0	A.
Washington	64	T.	1				1													1			1	4			1		1	1		1		12	9	T.
		A.																																0	0	A.
West Virginia	43	T.					4	3	1																									8	3	T.
		A.																																0	0	A.
Wisconsin	60	T.	1	11	14	18	8	11	2								7	3	1	1			1	6	1			2	10	7		4	2	110	19	T.
		A.																																0	0	A.
Wyoming	31	T.				1										1	1														2			5	4	T.
		A.																		1														1	1	A.
Sums	2,893	T.	72	61	66	63	91	140	67	70	5	5	18	20	14	13	42	57	6	13	13	31	74	57	26	15	12	34	84	95	64	129	76	1,533	..	T.
		A.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	2	1	0	2	0	0	0	10	....	A.

TABLE VIII.—*Average hourly sunshine (in percentages), October, 1900.*

Stations.	Instrument.	A. M. 5	6	7	8	9	10	11	Noon	P. M. 1	2	3	4	5	6	7	8	Hours of sunshine. Total. Actual.	Possible.	Percent of possible.	Personal estimate.
																		Hours.	*Hours*		
Albany, N. Y	T.	......	0	9	18	38	50	57	62	66	61	59	47	30	22	......	......	155.8	347.8	46	41
Atlanta, Ga.	T.	......	0	26	38	45	50	52	61	64	65	62	53	35	16	......	......	171.5	350.9	49	36
Atlantic City, N. J	T.	......	0	33	37	41	50	52	55	61	61	54	41	27	25	......	......	159.7	346.0	46	41
Baltimore, Md	T.	......	0	29	32	38	48	56	54	52	51	46	41	27	28	......	......	148.6	346.0	43	39
Binghamton, N. Y	T.	......	40	22	19	24	40	51	51	50	45	33	30	38	39	......	......	126.6	342.5	37	32
Bismarck, N. Dak	P.	......	0	44	48	61	59	61	61	59	65	61	65	65	50	......	......	199.3	336.7	59	63
Boise, Idaho	P.	......	0	47	48	57	56	63	57	60	54	58	49	44	43	......	......	183.4	340.5	54	47
Boston, Mass	T.	......	0	34	38	38	43	49	55	51	49	46	40	29	27	......	......	146.5	342.5	43	35
Buffalo, N. Y	T.	......	75	51	51	59	71	75	71	73	68	64	49	37	40	......	......	206.9	341.8	60	38
Cedar City, Utah	T.	......	100	67	73	84	85	89	88	93	96	89	78	68	73	......	......	286.7	347.3	83	64
Charleston, S. C.	T.	......	0	31	38	48	53	56	63	62	65	56	47	26	19	......	......	170.3	351.5	48	50
Chattanooga, Tenn	T.	......	33	16	26	51	63	77	76	71	64	57	57	45	34	......	......	190.4	350.1	54	49
Cheyenne, Wyo	P.	......	55	74	75	83	81	78	77	87	85	84	75	64	58	......	......	267.3	343.9	78	69
Chicago, Ill	T.	......	60	64	62	63	62	68	75	70	65	65	65	64	68	......	......	226.3	342.5	66	57
Cincinnati, Ohio	T.	......	100	65	68	69	67	73	81	87	86	77	73	66	56	......	......	254.3	346.0	73	61
Cleveland, Ohio	T.	......	100	50	54	59	69	72	75	77	71	66	63	52	51	......	......	220.0	342.5	64	55
Columbia, Mo.	T.	......	100	69	69	78	83	82	81	78	78	77	69	65	66	......	......	259.6	346.0	75	55
Columbus, Ohio	T.	......	100	51	52	59	74	70	72	70	74	64	62	63	57	......	......	223.2	344.9	65	57
Denver, Colo	P.	......	100	59	71	82	88	91	93	91	88	82	79	73	60	......	......	280.0	344.9	81	70
Des Moines, Iowa	T.	......	0	46	44	52	64	62	66	66	59	59	58	48	60	......	......	195.7	342.5	57	48
Detroit, Mich	T.	......	0	38	41	63	75	70	77	77	65	55	38	20	18	......	......	191.0	342.5	56	51
Dodge, Kans	P.	......	0	54	65	70	75	81	83	78	84	79	81	71	67	......	......	259.1	347.3	75	65
Dubuque, Iowa	T.	......	0	42	41	55	59	65	69	71	66	63	60	55	53	......	......	202.3	342.5	59	55
Eastport, Me	P.	......	0	15	24	30	38	40	45	54	50	55	47	39	29	......	......	135.9	339.8	40	37
Elkins, W. Va.	T.	......	0	0	3	28	59	69	69	69	65	50	38	11	5	......	......	143.4	346.0	41	46
Erie, Pa	T.	......	40	24	26	45	62	70	75	70	72	70	52	39	36	......	......	189.5	342.5	55	55
Escanaba, Mich	T.	......	0	29	29	34	40	46	57	57	62	61	44	43	43	......	......	155.8	338.5	46	45
Eureka, Cal	P.	......	45	21	28	40	50	56	55	61	51	47	42	38	38	......	......	154.3	343.9	45	43
Fresno, Cal.	T.	......	50	59	66	74	75	81	84	89	93	84	80	65	58	......	......	267.6	347.9	77	67
Galveston, Tex.*	P.	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Grand Junction, Colo	P.	......	100	73	68	76	79	80	79	78	78	84	78	75	85	......	......	268.0	346.0	77	61
Harrisburg, Pa	T.	......	0	39	40	46	51	58	60	63	60	52	50	41	38	......	......	174.7	344.9	51	44
Helena, Mont	P.	......	0	34	40	60	61	55	62	67	72	66	60	56	53	......	......	196.2	336.7	58	45
Huron, S. Dak	T.	......	0	42	39	40	51	53	59	59	63	59	56	61	64	......	......	182.1	340.5	53	52
Indianapolis, Ind	T.	......	100	53	52	56	69	74	80	78	68	64	56	66	67	......	......	226.1	344.9	66	57
Jacksonville, Fla.	T.	......	18	31	32	33	45	53	51	50	50	46	38	38	35	......	......	149.5	354.7	42	33
Jupiter, Fla	T.	......	12	22	43	52	57	60	59	51	60	50	30	16	7	......	......	155.7	357.1	44	34
Kalispell, Mont	T.	......	0	14	18	31	41	41	44	39	40	36	24	8	0	......	......	102.3	335.8	30	31
Kansas City, Mo.	P.	......	0	51	49	59	56	62	60	58	62	65	60	51	69	......	......	200.5	346.0	58	62
Knoxville, Tenn	T.	......	33	27	40	62	72	86	93	86	80	76	65	55	41	......	......	233.4	348.9	67	55
Lexington, Ky	T.	......	100	40	50	71	77	89	88	88	87	80	62	46	34	......	......	243.5	347.3	70	62
Little Rock, Ark	T.	......	67	51	50	54	64	72	71	71	79	69	60	61	66	......	......	224.3	350.1	64	47
Los Angeles, Cal	P.	......	33	49	53	59	67	71	75	80	82	87	88	84	71	......	......	254.3	350.9	72	61
Louisville, Ky	T.	......	100	54	52	50	71	79	81	74	66	64	58	48	54	......	......	222.5	347.3	64	64
Macon, Ga	T.	......	33	41	43	51	65	67	76	80	78	74	65	39	20	......	......	212.1	351.5	60	48
Meridian, Miss	T.	......	40	29	31	37	62	65	63	57	59	59	46	44	44	......	......	176.6	352.8	50	41
Mount Tamalpais, Cal	P.	......	0	60	61	71	74	76	72	74	75	72	74	65	59	......	......	243.3	347.3	70	64
Nashville, Tenn	T.	......	67	46	60	71	82	84	88	85	89	83	76	56	50	......	......	258.7	348.9	74	46
New Haven, Conn	T.	......	36	36	33	45	51	60	65	66	66	62	51	39	34	......	......	178.4	343.9	52	40
New Orleans, La	T.	......	50	49	49	63	74	62	66	70	67	53	36	26	18	......	......	192.4	354.7	54	50
New York, N. Y	T.	......	36	36	44	47	51	52	51	53	57	47	38	28	21	......	......	155.5	343.9	45	38
Norfolk, Va	T.	......	0	15	20	35	46	57	60	61	57	48	32	10	9	......	......	137.4	347.9	39	44
Northfield, Vt	P.	......	0	19	23	32	43	53	50	57	58	48	40	37	56	......	......	145.7	340.5	43	39
Oklahoma, Okla	T.	......	33	33	41	52	60	62	63	70	75	63	56	45	30	......	......	194.6	350.1	56	48
Omaha, Nebr	T.	......	0	47	55	64	69	73	80	78	73	72	72	56	50	......	......	231.1	343.9	67	56
Parkersburg, W. Va	T.	......	0	6	16	51	59	71	82	79	78	69	48	36	29	......	......	186.6	346.0	54	53
Philadelphia, Pa	P.	......	0	41	42	43	45	52	59	61	61	56	46	35	23	......	......	168.0	344.9	49	41
Phoenix, Ariz	T.	......	67	77	81	87	83	83	83	84	79	84	77	77	72	......	......	284.5	351.5	81	72
Pittsburg, Pa	T.	......	100	49	45	54	61	65	64	68	65	60	51	45	47	......	......	195.4	343.9	57	58
Pocatello, Idaho	T.	......	0	44	43	47	49	56	70	71	72	60	50	50	54	......	......	190.6	341.8	56	41
Portland, Me	T.	......	0	22	36	56	62	66	72	74	73	69	51	42	24	......	......	192.8	340.5	57	40
Portland, Oreg	T.	......	0	12	12	12	20	35	47	46	40	35	33	23	27	......	......	98.8	348.5	29	31
Pueblo, Colo	T.	......	100	56	62	80	90	98	96	92	90	90	82	64	57	......	......	282.2	347.8	81	63
Raleigh, N. C	T.	......	0	39	45	56	66	70	78	78	72	70	59	35	21	......	......	208.0	348.9	60	55
Rochester, N. Y	T.	......	0	32	38	47	63	69	70	68	71	69	60	31	32	......	......	191.3	341.8	56	51
St. Louis, Mo	T.	......	0	43	44	59	69	77	80	78	75	74	66	62	69	......	......	230.1	346.0	67	62
St. Paul, Minn	P.	......	100	39	40	56	60	58	57	54	51	56	56	50	54	......	......	179.8	339.8	53	47
Salt Lake City, Utah	T.	......	36	41	40	46	61	65	65	69	67	68	68	67	78	......	......	208.8	343.9	61	56
San Diego, Cal	P.	......	67	42	45	48	60	72	83	85	85	82	86	83	83	......	......	248.8	351.5	71	71
San Francisco, Cal.	T.	......	45	51	53	65	77	86	92	97	95	89	81	69	60	......	......	268.9	347.3	77	61
Santa Fe, N. Mex.	P.	......	67	78	75	80	81	83	85	84	87	83	81	67	62	......	......	278.2	348.9	80	69
Sault Ste. Marie, Mich.	T.	......	......	3	11	26	36	52	61	59	55	50	39	34	29	......	......	134.0	338.5	40	37
Savannah, Ga.	T.	......	20	41	49	55	52	62	64	64	58	53	45	35	22	......	......	180.9	352.8	51	47
Seattle, Wash	T.	......	0	0	12	20	34	43	48	42	44	41	33	22	23	......	......	106.3	335.8	32	27
Spokane, Wash.	T.	......	......	6	6	5	14	34	33	35	33	21	6	3	3	......	......	60.7	335.8	18	17
Tacoma, Wash.	T.	......	0	6	8	23	33	43	46	36	29	28	25	15	12	......	......	91.0	336.7	27	25
Tampa, Fla.	T.	......	44	60	70	74	84	89	84	85	79	63	46	26	16	......	......	237.3	356.3	67	45
Toledo, Ohio	T.	......	0	54	56	68	77	77	79	75	76	71	49	34	28	......	......	220.7	342.5	64	60
Topeka, Kans.	T.	......	55	55	53	58	58	64	69	69	71	71	65	60	82	......	......	220.0	346.0	64	60
Vicksburg, Miss.	T.	......	60	56	38	48	61	64	66	57	54	52	48	42	37	......	......	179.8	352.8	51	45
Washington, D. C.	P.	......	0	32	34	39	51	51	51	55	56	57	55	54	47	......	......	168.7	346.0	49	46
Wilmington, N. C.	T.	......	15	46	55	65	80	85	88	87	86	83	77	58	40	......	......	254.9	350.9	73	55
Yankton, S. Dak.	T.	......	0	41	49	57	73	78	78	77	77	77	73	58	44	......	......	229.5	341.8	67	64
Basseterre, St. Kitts	T.	......	29	37	65	83	88	92	98	93	88	85	66	47	28	......	......	267.5	364.5	73	58
Bridgetown, Barbados	T.	......	29	41	59	88	89	94	78	85	77	75	65	48	41	......	......	261.2	367.3	71	35
Cienfuegos, Cuba	T.	......	68	69	78	80	74	78	81	76	66	64	45	32	19	......	......	234.5	360.9	65	60
Havana, Cuba	T.	......	59	50	64	73	88	84	86	79	79	66	52	19	8	......	......	231.6	360.1	64	36
Kingston, Jamaica, W. I	T.	......	57	51	77	90	95	89	86	76	60	48	37	28	28	......	......	236.5	363.7	65	48
Port of Spain, Trinidad, W. I.	T.	......	40	40	58	68	69	75	64	64	63	45	41	24	9	......	......	194.1	368.7	53	29
Puerto Principe, Cuba	T.	......	52	42	54	79	85	86	86	76	69	48	44	11	4	......	......	215.3	361.7	60	51
Roseau, Dominica, W. I.	T.	......	40	39	51	59	65	79	80	79	79	83	64	48	26	......	......	232.1	366.4	63	46
San Juan, Porto Rico	T.	......	20	43	61	80	78	78	77	72	65	60	52	24	15	......	......	217.1	363.7	60	52
Santiago de Cuba, Cuba	T.	......	90	75	71	69	80	82	80	71	76	64	50	52	47	......	......	249.6	362.1	69	45
Santo Domingo, Santo Domingo	T.	......	57	52	54	72	79	72	73	72	71	49	25	14	13	......	......	201.0	363.7	55	51
Willemstad, Curaçao	T.	......	10	10	29	55	66	74	74	72	81	79	73	54	32	......	......	213.9	367.7	58	46

* No record.

TABLE IX.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded* 0.25 *in any* 5 *minutes, or* 0.75 *in* 1 *hour during October,* 1900, *at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	27			0.62														0.30			
Alpena, Mich.	5			0.33														0.22			
Atlanta, Ga.	23			0.38						0.38											
Atlantic City, N. J.	13			0.45														0.36			
Baltimore, Md.	8			0.40							0.40										
Binghamton, N. Y.	8			0.44														0.20			
Bismarck, N. Dak.	29-30			1.30														*			
Boise, Idaho	19			0.75														0.16			
Boston, Mass.	8-10			1.99														0.17			
Buffalo, N. Y.	30			0.92														0.34			
Cairo, Ill.	21-22			0.80														0.23			
Cedar City, Utah	12			0.18														*			
Charleston, S. C.	8	7.37 p.m.	8.38 p.m.	0.68	8.05 p.m.	8.25 p.m.	0.05	0.09	0.29	0.52	0.61	0.63									
Do	11-12	7.43 p.m.	11.15 a.m.	1.61	7.05 a.m.	8.07 a.m.	0.83	0.05	0.09	0.14	0.23	0.34	0.43	0.52	0.59	0.67	0.72	0.84			
Chicago, Ill.	29			0.52														0.31			
Cincinnati, Ohio	6-7			1.24														0.31			
Cleveland, Ohio	7			0.67														0.52			
Columbia, Mo.	6-7	8.24 p.m.	D. N.	2.03	8.47 p.m.	9.28 p.m.	0.01	0.18	0.32	0.53	0.82	0.93	1.04	1.11	1.28	1.31	1.32	1.36	1.60	1.75	
Do	28	1.04 p.m.	5.10 p.m.	2.24	1.04 p.m.	1.35 p.m.	0.00	0.12	0.21	0.34	0.60	0.90	1.04	1.07	1.10	1.11	1.11	1.27	1.66	1.77	1.92
Columbus, Ohio	22-23	6.00 p.m.	D. N.	2.06	1.47 p.m.	2.40 p.m.	0.42	0.18	0.31	0.41	0.44	0.46	0.53	0.67	0.85	0.97	1.04	1.10	1.30	1.56	
Denver, Colo.	29			0.12									0.12								
Des Moines, Iowa	30-31			1.56														0.29			
Detroit, Mich.	29-30			1.47														*			
Dodge, Kans	20-21			0.58														0.30			
Duluth, Minn.	28			0.66														0.46			
Eastport, Me.	10-12			6.57														0.72			
Elkins, W. Va	13			1.01														0.34			
Erie, Pa.	7-8			0.77														0.43			
Escanaba, Mich.	3			0.57														0.51			
Evansville, Ind	7	1.30 a.m.	6.55 a.m.	2.09	2.05 a.m.	2.40 a.m.	0.06	0.07	0.10	0.16	0.27	0.39	0.53	0.67	0.70						
					3.55 a.m.	4.30 a.m.	0.88	0.15	0.39	0.55	0.68	0.75	0.88	1.00	1.01						
Fort Worth, Tex.	21	2.05 a.m.	7.20 a.m.	1.52	2.08 a.m.	2.40 a.m.	T.	0.14	0.31	0.48	0.66	0.97	1.09	1.18							
Fresno, Cal.	3-4			0.20														*			
Galveston, Tex.	21	12.05 p.m.	5.10 p.m.	1.00	1.00 p.m.	1.15 p.m.	0.20	0.10	0.30	0.80											
Grand Junction, Colo.	20			0.06														*			
Harrisburg, Pa	13 14			0.85														0.46			
Hatteras, N. C.	8-9	8.45 p.m.	2.30 a.m.	1.20	8.50 p.m.	10.10 p.m.	T.	0.06	0.23	0.33	0.43	0.51	0.57	0.58	0.64	0.68	0.69	0.71	1.02		
Huron, S. Dak.	6			0.56														0.31			
Indianapolis, Ind.	6-7	8.50 p.m.	10.20 a.m.	1.65	4.35 a.m.	5.05 a.m.	0.10	0.07	0.23	0.56	0.67	0.73	0.79	0.81							
Jacksonville, Fla.	8	10.25 p.m.	11.35 p.m.	1.10	10.40 p.m.	11.15 p.m.	T.	0.11	0.39	0.70	0.92	1.01	1.05	1.09							
Jupiter, Fla.	16-17	5.08 p.m.	3 00 a.m.	3.14	1.02 a.m.	2.05 a.m.	0.86	0.40	0.78	1.16	1.44	1.49	1.54	1.58	1.68	1.88	2.00	2.13	2.23		
Kallispell, Mont	3			0.10													0.10				
Kansas City, Mo.	28	2.45 p.m.	D. N.	1.64	7.15 p.m.	8.25 p.m.	0.45	0.11	0.24	0.33	0.39	0.43	0.59	0.71	0.81	0.87	0.89	0.99	1.17		
Key West, Fla.	5	3.50 a.m.	7.40 a.m.	1.04	3.50 a.m.	4.20 a.m.	0.00	0.12	0.45	0.67	0.82	0.97	1.01								
Do	14	3.10 p.m.	4.25 p.m.	1.38	3.15 p.m.	3.55 p.m.	0.01	0.05	0.20	0.31	0.37	0.50	0.75	1.15	1.35						
Knoxville, Tenn	7			0.93														0.47			
Lexington, Ky.	7-8			0.56														0.25			
Lincoln, Nebr.	1			0.75														0.74			
Little Rock, Ark.	21			0.96														0.45			
Los Angeles, Cal.	13			0.25														0.21			
Louisville, Ky.	6-7			1.53														0.42			
Macon, Ga.	5			0.18								0.18									
Memphis, Tenn.	21-22			1.44														0.64			
Meridian, Miss.	31	5.40 p.m.	11.45 p.m.	1.53	8.03 p.m.	8.30 p.m.	0.49	0.21	0.47	0.59	0.69	0.72	0.78	0.80	0.81	0.83	0.87	0.91			
Milwaukee, Wis.	3			0.56														0.55			
Montgomery, Ala.	21			0.98														0.61			
Nantucket, Mass.	13-14			1.48														0.50			
Nashville, Tenn.	22	8.24 a.m.	10 15 a.m.	0.79	9.48 a.m.	10.15 a.m.	0.03	0.07	0.31	0.48	0.65	0.74	0.76								
New Haven, Conn.	8-9			1.07														0.21			
New Orleans, La.	7	4.00 p.m.	8.30 p.m.	1.25	4.05 p.m.	4.55 p.m.	T.	0.10	0.20	0.29	0.40	0.42	0.55	0.66	0.75	1.01	1.10	1.15			
New York, N. Y.	8	2.45 p.m.	9.28 p.m.	1.24	4.13 p.m.	5.20 p.m.	0.02	0.06	0.21	0.26	0.31	0.41	0.48	0.56	0.69	0.72	0.73	0.77	0.93		
Do	13-14	9.29 p.m.	11.10 a.m.	2.10	3.00 p.m.	4.30 p.m.	0.71	0.06	0.12	0.18	0.24	0.34	0.39	0.43	0.47	0.58	0.73	0.88	1.12	1.27	
Norfolk, Va.	8-9			0.79														0.64			
Northfield, Vt.	10-11			0.95														0.20			
Oklahoma, Okla.	20-21			0.54														0.38			
Omaha, Nebr.	30	2.55 p.m.	7.30 p.m.	0.80	6.05 p.m.	6.50 p.m.	0.12	0.03	0.12	0.18	0.25	0.33	0.41	0.52	0.63	0.67					
Parkersburg, W. Va.	6			0.32														0.32			
Philadelphia, Pa.	13-14			1.37														0.42			
Pittsburg, Pa.	23			1.08														0.34			
Pocatello, Idaho	19			0.52														0.27			
Portland, Me.	8-9	6.42 p.m.	1.20 p.m.	1.66	6.45 p.m.	7.35 p.m.	T.	0.04	0.08	0.15	0.17	0.23	0.30	0.57	0.68	0.84	0.89	0.95			
Portland, Oreg.	30-31			0.82														0.15			
Pueblo, Colo.	15			0.12						0.12											
Raleigh, N. C.	8			0.34														0.34			
Richmond, Va.	8			0.72														0.52			
Rochester, N. Y.	7-8			1.30														0.30			
St. Louis, Mo.	29	12.01 p.m.	12.58 p.m.	0.68	12.01 p.m.	12.50 p.m.	0.00	0.05	0.18	0.28	0.28	0.29	0.33	0.43	0.60	0.65	0.68				
St. Paul, Minn.	3-4	9.30 p.m.	8 20 a.m.	2.17	10.40 p.m.	11.40 p.m.	0.09	0.05	0.09	0.12	0.17	0.27	0.33	0.38	0.44	0.79	0.94	1.04	1.15	1.26	1.39
Salt Lake City, Utah	19-20			0.51														0.25			
San Diego, Cal.	20			0.20														*			
Sandusky, Ohio	6-7			0.73														0.28			
San Francisco, Cal.	2-3			0.30														0.19			
Savannah, Ga.	2-3	D. N.	7.30 a.m.	2.82	12.35 a.m.	1.42 a.m.	T.	0.12	0.34	0.54	0.57	0.58	0.59	0.60	0.66	0.73	0.94	1.16	1.28	1.58	1.84
Seattle, Wash.	19			0.71														0.40			
Spokane, Wash.	4-5			0.48														0.14			
Tampa, Fla.	4	4.02 p.m.	6.08 p.m.	1.20	5.12 p.m.	5.37 p.m.	0.40	0.55	0.60	0.65	0.70	0.80									
Toledo, Ohio	22			0.52														0.33			
Topeka, Kans.	30-31			1.38														0.59			
Vicksburg, Miss.	21-22	6.25 p.m.	D. N.	1.94	6.42 p.m.	7.45 p.m.	0.01	0.31	0.46	0.46	0.47	0.47	0.71	0.89	0.93	0.96	0.97	1.11	1.21	1.27	1.31
Washington, D. C.	8			0.23						0.23											
Wilmington, N. C.	24	12.58 p.m.	3.50 p.m.	1.20	1.40 p.m.	2.30 p.m.	0.04	0.05	0.10	0.14	0.19	0.26	0.40	0.61	0.80	0.97	1.12	1.14			
Yankton, S. Dak	20-22			1.42																	
Basseterre, St. Kitts	23-24	2.24 p.m.	D. N.	4.80	2.55 p.m.	4.55 p.m.	0.09	0.09	0.17	0.31	0.46	0.70	0.87	0.92	0.97	1.09	1.15	1.25	2.15	2.77	3.54
Bridgetown, Barbados	24			0.51										0.49							
Cienfuegos, Cuba	5	2.00 p.m.	4.00 p.m.	2.59	2.02 p.m.	3.00 p.m.	T.	0.19	0.70	0.95	1.18	1.24	1.32	1.59	1.78	1.97	2.22	2.54			
Do	6	4.30 p.m.	6.20 p.m.	2.08	4.32 p.m.	5.30 p.m.	T.	0.18	0.48	0.62	0.68	0.71	0.78	0.91	1.04	1.22	1.50	1.74	1.93	2.08	
Do	27	11.55 a.m.	3.50 p.m.	0.88	12.04 p.m.	12.24 p.m.	0.01	0.20	0.50	0.61	0.66										

TABLE IX.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration.		Total am't of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time as indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
1		2	3	4	5	6	7														
Havana, Cuba	14			0.44									0.44								
Kingston, Jamaica	4			0.44								0.44									
Port of Spain, Trin.	8			0.48									0.48								
Puerto Principe, Cuba	10	4.(8 p. m.	7.15 p. m.	3.98	4.10 p. m.	5.00 p. m.	T.	0.04	0.07	0.13	0.33	0.62	0.92	1.08	1.17	1.24	1.27				
					5.00 p. m.	6.30 p. m.		1.36	1.76	2.11	2.38	2.67	2.84	2.93	2.96	3.00	3.08	3.48	3.84	3.96	
Roseau, Dominica	13			0.58														0.44			
San Juan, Porto Rico	4	2.03 p. m.	4.08 p. m.	1.03	2.05 p. m.	2.45 p. m.	T.	0.07	0.18	0.41	0.68	0.77	0.87	0.91	0.97	0.98	0.99	1.01			
Do	23	8.08 a. m.	11.55 a. m.	1.45	11.20 a. m.	11.40 a. m.	0.31	0.18	0.38	0.74	1.04	1.08	1.12	1.14							
Do	23-24	10.40 p. m.	3.20 a. m.	1.36	2.20 a. m.	2.37 a. m.	0.24	0.21	0.62	0.98	1.06										
Santiago de Cuba	21	4.32 p. m.	6.05 p. m.	1.17	4.33 p. m.	5.20 p. m.	T.	0.17	0.42	0.60	0.62	0.66	0.72	0.82	0.97	1.02	1.09	1.14			
Santo Domingo, S. D.	18	11.45 a. m.	9.20 p. m.	1.84	4.50 p. m.	5.21 p. m.	0.75	0.13	0.29	0.47	0.62	0.83	0.88	0.92							
Do	26	3.45 a. m.	4.30 p. m.	7.15	4.50 a. m.	5.40 a. m.	0.31	0.10	0.21	0.21	0.27	0.37	0.65	0.90	1.11	1.30	1.34				
					5.40 a. m.	6.30 a. m.		1.53	1.71	1.87	2.15	2.27	2.76	3.14	3.24	3.34	3.35				
					6.30 a. m.	7.20 a. m.		3.44	3.53	3.74	3.97	4.10	4.12	4.15	4.26	4.49	4.66				
					7.20 a. m.	8.15 a. m.		4.76	4.88	5.04	5.14	5.23	5.39	5.66	5.82	5.96	6.03	6.13			
Willemstad, Curaçao	16			0.61														0.61			

*Self register not working.

TABLE X.—*Data furnished by the Canadian Meteorological Service, October, 1900.*

Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.86	30.01	+.06	44.0	− 1.4	50.3	37.7	2.35	−3.27	
Sydney, C. B. I	30.09	30.13	+.17	49.0	+ 2.5	57.1	40.9	2 36	−1.94	
Halifax, N. S	30.03	30.14	+.16	53.2	+ 6.0	61.0	45.3	7 38	+1.99	0.1
Grand Manan, N. B	30.10	30.15	+.21	51.1	+ 4.2	58.0	44.2	12.64	+7.96	T.
Yarmouth, N. S	30.08	30.16	+.18	53.3	+ 5.7	59 8	46.8	11.38	+7.35	0.7
Charlottet'n, P. E. I	30.09	30.13	+.21	50.4	+ 3.9	57.7	43.1	7.09	+2.61	0.4
Chatham, N. B	30.12	30.14	+.18	49.6	+ 6.6	59.0	40.1	6.01	+2.12	1.0
Father Point, Que	30.11	30.14	+.17	42 6	+ 2.8	51.2	34.0	2.41	−0.21	
Quebec, Que	29.83	30.16	+.17	49.2	+ 6.8	56.7	41.7	2.75	−0.90	
Montreal, Que	......	......	......	......	......	......	......	......	......	
Bissett, Ont	29.55	30.16	+.14	50.5	+ 9.0	63.7	37.2	1.58	−1.12	
Ottawa, Ont	29 80	30.12	+.12	53.8	+10.0	63.8	43.7	1.45	......	
Kingston, Ont	29.83	30.15	+.12	55.8	+ 8.8	63.6	48.0	2.87	−0.13	
Toronto, Ont	29.77	30.15	+.11	56 4	+ 9.8	66.0	46.7	2.12	−0.17	
White River, Ont	28.73	30.08	+.06	48.4	+11.3	58.8	38.0	2.81	+0.36	
Port Stanley, Ont	29.50	30.14	+.11	56.4	+ 8.6	65.5	47.4	2.24	−1.04	
Saugeen, Ont	29.43	30.14	+.14	56.0	+ 9.9	65.1	46.8	1.75	−2.06	

Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
Parry Sound, Ont	29.44	30.13	+.12	54.8	+10.9	64.4	45.1	2.85	−1.47	
Port Arthur, Ont	29.28	29.98	−.03	49.2	+ 9.3	57.0	41.5	5.20	+2.51	
Winnipeg, Man	29.16	29.90	−.10	46 1	+ 7 0	56.8	35.3	0.94	−0 79	
Minnedosa, Man	28.12	29.93	−.05	45.6	+ 7.8	56.1	35.2	0.85	−0.71	T.
Qu'Appelle, Assin	27.63	29.89	−.09	44 3	+ 4.9	54.5	34.1	0.86	−0.16	1.1
Medicine Hat, Assin.	27.58	29.89	−.08	44 9	+ 0.1	56.4	33.3	1.02	+0.58	5.7
Swift Current, Assin.	27.32	29.91	−.09	43.6	+ 1.5	53.3	33.8	0.47	−0 76	1.1
Calgary, Alberta	26.27	29.84	−.13	38.1	− 2.0	49.4	26.9	0.40	+0.04	2.4
Banff, Alberta	25.22	29.92	......	36 4	− 2.9	43.6	29.3	2.30	+1.67	11.6
Edmonton, Alberta	27.48	29.80	−.16	40.4	− 0.7	49.4	31.4	1.16	+0.59	11.1
Prince Albert, Sask	28.28	29.84	......	41.0	+ 3.9	50.3	31.8	1.33	+0.70	3.0
Battleford, Sask	28.12	29.87	......	41.8	+ 2.2	52.2	31.4	0.87	+0.60	1.0
Kamloops, B. C	28.61	29.89	......	48.5	+ 1.5	57.3	39.6	0.64	−0.08	
Victoria, B. C	29.80	29.90	......	50.1	+ 1.1	55.1	45.2	2.68	......	
Barkerville, N. W. T.	25.47	29.84	......	34.4	− 5.3	41.4	27.4	5.20	+3.71	25.0
Hamilton, Bermuda.	29.92	30.08	+.09	73.6	+ 0.6	77.8	69.5	4.03	−4.31	

TABLE XI.—*Heights of rivers referred to zeros of gages, October, 1900.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn	1,954	14	6.6	7	4.3	27,31	5.4	2.3
Reeds Landing, Minn	1,884	12	8.5	8,9	3.8	27	5.8	4.7
La Crosse, Wis	1,819	12	11.1	11	5.7	27	8.3	5.4
Prairie du Chien, Wis	1,759	18	14.6	15	7.0	29	10.2	7.6
Dubuque, Iowa	1,699	15	14.6	17	7.2	30,31	10.1	7.4
Leclaire, Iowa	1,609	10	9.0	20	5.0	31	6.5	4.0
Davenport, Iowa	1,593	15	11.0	20,21	6.0	31	7.9	5.0
Muscatine, Iowa	1,562	16	12.5	21,22	7.4	3,4	9.3	5.1
Galland, Iowa	1,472	8	5.9	24,25	3.5	5	4.5	2.4
Keokuk, Iowa	1,463	15	10.0	24	6.2	5,6	7.6	3.8
Hannibal, Mo	1,402	13	10.9	26	7.3	6	8.3	3.6
Grafton, Ill	1,306	23	11.7	27	8.5	1	9.7	3.2
St. Louis, Mo	1,264	30	13.4	5	10.1	17,18	11.8	3.3
Chester, Ill	1,189	36	9.6	5,6,10	7.0	1	8.4	2.6
Memphis, Tenn	843	33	6.2	14	3.0	1,2	4.9	3.2
Helena, Ark	767	42	10.6	15,16	6.3	1,3	8.7	4.3
Arkansas City, Ark	635	42	13.0	11-13	6.7	1	10.2	6.3
Greenville, Miss	595	42	10.4	12,13	5.4	1	8.2	5.0
Vicksburg, Miss	474	45	9.6	14	2.9	1	6.9	6.7
New Orleans, La	108	16	4.6	13	4.0	{1,2,9, 10,17-20, 22,25,26}	4.2	0.6
Missouri River.								
Bismarck, N. Dak	1,309	14	1.4	27-31	1.0	2-7,13,14	1.2	0.4
Pierre, S. Dak	1,114	14	2.9	1	1.7	21-23	2.0	1.2
Sioux City, Iowa	784	19	5.9	5-7	4.5	18	5.2	1.4
Omaha, Nebr	669	18	6.4	1,8,31	5.3	18-20	5.9	1.1
St. Joseph, Mo	481	10	2.9	3	0.5	21	1.5	2.4
Kansas City, Mo	388	21	10.2	3	6.1	21	7.6	4.1
Boonville, Mo	199	20	9.8	7	5.3	25	7.0	4.5
Hermann, Mo	103	24	10.3	3	4.8	26-28	6.9	5.5
Illinois River.								
Peoria, Ill	135	14	7.0	11	6.2	21	6.6	0.8
Youghiogheny River.								
Confluence, Pa	59	10	0.9	24	0.0	4-7,23	0.3	0.9
West Newton, Pa	15	23	0.7	25	0.0	{1,3, 4,6,7,13}	0.2	0.7
Allegheny River.								
Warren, Pa	177	14	0.6	11,28,29	− 0.4	4-9	0.1	1.0
Oil City, Pa	123	13	0.8	27	− 0.1	1-8	0.2	0.9
Parker, Pa	73	20	0.9	26-28	− 0.2	1	0.4	1.1
Monongahela River.								
Weston, W. Va	161	18	0.9	24	− 1.8	1,2	−0.9	2.7
Fairmont, W. Va	119	25	1.2	25-27	− 0.7	1-14	−0.2	1.9
Greensboro, Pa	81	18	7.3	16	5.7	10-13	6.3	1.6
Lock No. 4, Pa	40	28	8.6	26,27	3.5	5	5.3	5.1
Conemaugh River.								
Johnstown, Pa	64	7	1.2	9,24,25	0.3	2-5	0.8	0.9
Red Bank Creek.								
Brookville, Pa	35	8	1.4	24	0.1	4-7	0.6	1.3
Beaver River.								
Ellwood Junction, Pa	10	14	0.5	1	0.1	6,17	0.2	0.4
Great Kanawha River.								
Charleston, W. Va	61	30	17.8	25	5.0	28	6.8	12.8
Little Kanawha River.								
Glenville, W. Va	100	24	0.0	25	− 1.7	4-7,22	−1.3	1.7
New River.								
Hinton, W. Va	95	14	12.0	24	1.1	2,22	1.9	10.9
Cheat River.								
Rowlesburg, W. Va	36	14	3.0	3	1.0	1	1.7	2.0
Ohio River.								
Pittsburg, Pa	966	22	6.5	14	5.0	28	6.0	1.5
Davis Island Dam, Pa	960	25	3.6	27	1.2	1	2.0	2.4
Wheeling, W. Va	875	36	3.2	28	0.3	2,3	1.2	2.9
Parkersburg, W. Va	785	36	4.0	30	0.8	6	1.7	3.2
Point Pleasant, W. Va	703	39	10.0	26	1.0	4-8	2.0	9.0
Huntington, W. Va	660	50	13.4	26	2.0	7,8	3.9	11.4
Catlettsburg, Ky	651	50	11.7	26	1.3	18,19	2.7	10.4
Portsmouth, Ohio	612	50	12.2	27	2.0	5,8,18,19	3.3	10.2
Cincinnati, Ohio	499	50	11.4	29	3.1	21	4.2	8.3
Madison, Ind	413	46	9.6	30	3.1	20-23	3.9	6.5
Louisville, Ky	367	28	5.6	31	2.0	19-24	2.5	3.6
Evansville, Ind	184	35	3.6	8,9	1.0	27	1.7	2.6
Paducah, Ky	47	40	4.6	16	1.6	6	2.5	3.0
Cairo, Ill	1,073	45	12.6	12	8.2	1	11.0	4.4
Muskingum River.								
Zanesville, Ohio	70	20	7.5	25	6.0	20-23	6.5	1.5
Scioto River.								
Columbus, Ohio	110	17	2.2	23-25	1.9	3,5,6	2.0	0.3
Miami River.								
Dayton, Ohio	69	18	2.5	8	0.9	5,17-21	1.2	1.6
Wabash River.								
Mount Carmel, Ill	50	15	3.8	11	1.2	30,31	2.3	2.6
Licking River.								
Falmouth, Ky	30	25	1.0	23,24	0.3	31	0.6	0.7
Clinch River.								
Speers Ferry, Va	156	20	− 0.1	26	− 0.7	22	−0.5	0.6
Clinton, Tenn	46	25	4.0	1,2	2.5	22	3.3	1.5
Tennessee River.								
Knoxville, Tenn	614	29	9.4	25	0.0	23	1.3	9.4
Kingston, Tenn	534	25	4.8	26	0.8	{8,14-16, 19-22}	1.4	4.0
Chattanooga, Tenn	430	33	7.5	27	1.2	21,22	2.5	6.3
Bridgeport, Ala	390	24	5.0	27	0.3	8,20-22	1.1	4.7
Florence, Ala	290	16	4.7	29	0.5	6,7	1.6	4.2

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Tennessee River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Riverton, Ala	190	25	5.4	30	− 0.7	6	1.2	6.1
Johnsonville, Tenn	94	21	6.1	15	1.3	6,7	2.9	4.8
Cumberland River.								
Burnside, Ky	434	50	0.0	1-4,28-31	− 0.2	10-27	−0.1	0.2
Carthage, Tenn	257	40	1.7	15	0.6	25,26	1.1	1.1
Nashville, Tenn	175	40	3.1	13	1.3	28-31	1.8	1.8
Arkansas River.								
Wichita, Kans	726	10	2.7	2,3	1.6	20	2.0	1.1
Webbers Falls, Ind. T	413	23	13.3	3	2.4	20,21,25,28	5.4	10.9
Fort Smith, Ark	351	22	13.8	3	2.6	22	6.2	11.2
Dardanelle, Ark	256	21	13.8	5	2.4	20	6.0	11.4
Little Rock, Ark	176	23	13.6	6	3.0	1	6.7	10.6
White River.								
Newport, Ark	150	26	3.1	2,25,26	1.1	21	2.1	2.0
Yazoo River.								
Yazoo City, Miss	80	25	9.1	31	− 0.7	11,12	1.8	9.8
Red River.								
Arthur City, Tex	688	27	18.0	2	6.5	20	8.8	11.5
Fulton, Ark	565	28	17.8	4	5.5	24,25	9.3	12.3
Shreveport, La	449	29	10.6	6	2.4	29	5.4	8.2
Alexandria, La	139	33	7.3	9	0.5	31	3.3	6.8
Ouachita River.								
Camden, Ark	340	39	9.6	25	4.3	21-23	5.8	5.3
Monroe, La	100	40	7.2	1	1.6	11-13	2.9	5.6
Atchafalaya River.								
Melville, La	100	31	12.1	15,16	6.8	1	10.1	5.3
Susquehanna River.								
Wilkesbarre, Pa	178	14	0.0	25-31	− 2.4	12	−0.7	2.4
Harrisburg, Pa	70	17	1.2	28,29	0.0	{1-3, 5-7, 9-12}	0.5	1.2
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	1.8	26	0.1	1-3	0.8	1.7
Juniata River.								
Huntingdon, Pa	80	24	2.9	1-31	2.9	1-31	2.9	0.0
Potomac River.								
Harpers Ferry, W. Va	170	16	1.0	26	0.0	1-3,13,14	0.2	1.0
James River.								
Lynchburg, Va	257	18	7.3	24	− 0.3	17-22	0.7	7.6
Richmond, Va	110	12	1.4	4,10,27	− 1.2	18-20	0.1	2.6
Roanoke River.								
Weldon, N. C	90	40	17.0	26	7.4	3	8.4	9.3
Cape Fear River.								
Fayetteville, N. C	100	38	2.9	17	0.6	4,29	1.1	2.3
Edisto River.								
Edisto, S. C	75	6	2.9	19,23,24	1.4	4,5	2.2	1.5
Pedee River.								
Cheraw, S. C	145	27	14.4	26	0.	1,2	1.8	13.8
Black River.								
Kingstree, S. C	60	12	0.5	28-31	− 0.4	1-6	0.0	0.9
Lynch Creek.								
Effingham, S. C	35	12	3.7	31	1.6	2,3	2.7	2.1
Santee River.								
St. Stephens, S. C	50	12	6.7	30,31	− 0.5	2,3	1.5	7.2
Congaree River.								
Columbia, S. C	37	15	1.8	26	− 0.3	3,21	0.1	2.1
Wateree River.								
Camden, S. C	45	24	24.0	26	1.4	2	4.8	22.6
Waccamaw River.								
Conway, S. C	40	7	2.8	13	0.6	25	1.9	2.2
Savannah River.								
Calhoun Falls, S. C	347	......	5.0	24	2.0	2,3	2.8	3.0
Augusta, Ga	268	32	17.8	25	5.7	21	7.5	12.1
Broad River.								
Carlton, Ga	30	......	5.0	24	2.1	1-3,22	2.7	2.9
Flint River.								
Albany, Ga	80	20	4.5	15,24	0.9	1	3.3	3.6
Chattahoochee River.								
Westpoint, Ga	239	20	5.0	24	2.5	2,3	3.3	2.5
Ocmulgee River.								
Macon, Ga	125	20	8.3	24	1.7	3	2.9	6.6
Oconee River.								
Dublin, Ga	60	30	5.6	26	− 0.3	2,3	1.1	5.9
Coosa River.								
Rome, Ga	225	30	12.5	24	0.9	5-7	2.7	11.6
Gadsden, Ala	144	18	10.5	26	0.0	3-8	2.3	10.5
Alabama River.								
Montgomery, Ala	265	35	10.6	28	1.4	3,4	4.8	9.2
Selma, Ala	212	35	13.0	29	0.5	5	4.4	12.5
Tombigbee River.								
Columbus, Miss	303	33	5.6	28	− 3.5	6,7	0.6	9.1
Demopolis, Ala	155	35	17.7	16	− 0.9	6,7	6.0	18.6
Black Warrior River.								
Tuscaloosa, Ala	129	43	22.5	13	0.2	4	6.3	22.3
Brazos River.								
Kopperl, Tex	369	21	8.4	1	− 0.2	20	2.5	8.6
Waco, Tex	301	22	12.0	1	1.8	19,20	4.2	10.2
Columbia River.								
Umatilla, Oreg	270	25	5.4	29-31	3.0	18	4.2	2.4
The Dalles, Oreg	166	40	7.6	31	4.2	19,20	5.6	3.4
Willamette River.								
Albany, Oreg	99	20	4.6	31	0.7	1	1.9	3.9
Portland, Oreg	10	15	6.3	31	21	17	3.4	4.2
Sacramento River.								
Red Bluff, Cal	241	23	8.0	5	− 0.5	1	1.5	8.5
Sacramento, Cal	70	29	13.5	22	7.6	1-4	9.5	5.9

Chart I. Tracks of Centers of High Areas. October, 1900.

Chart II. Tracks of Centers of Low Areas. October, 1900.

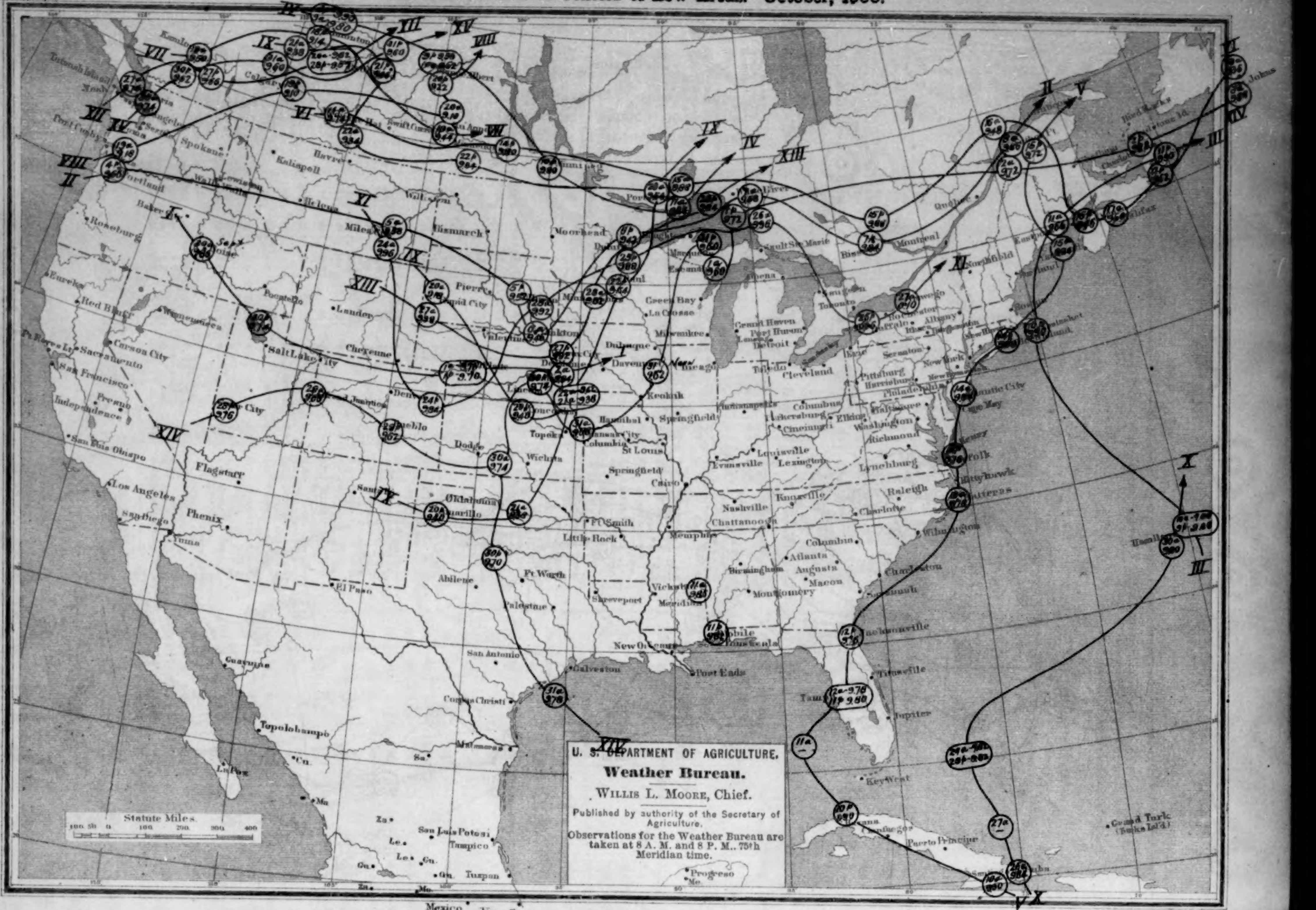

Chart III. Total Precipitation. October, 1900.

Chart III. Total Precipitation. October, 1900.

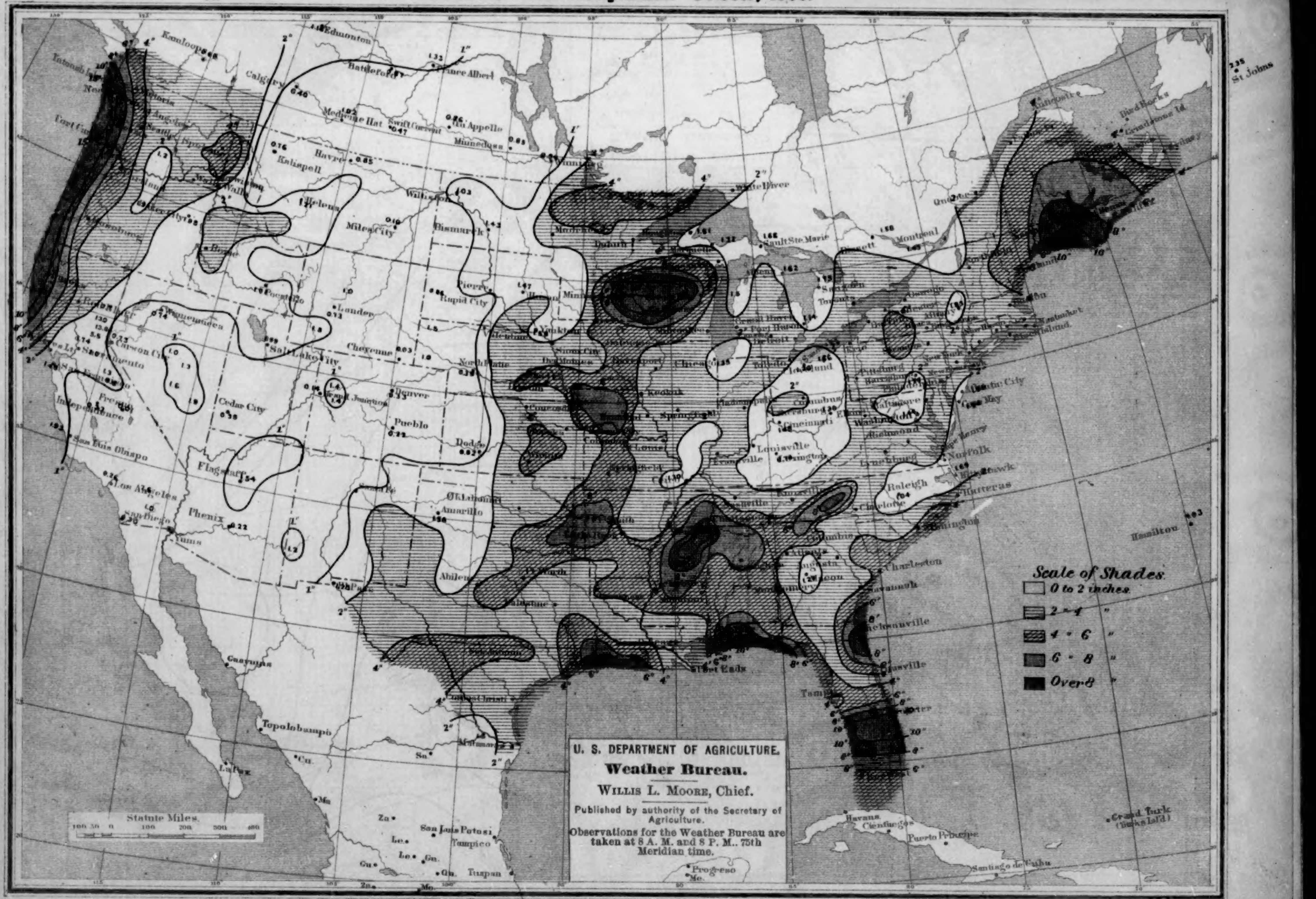

Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. October, 1900.

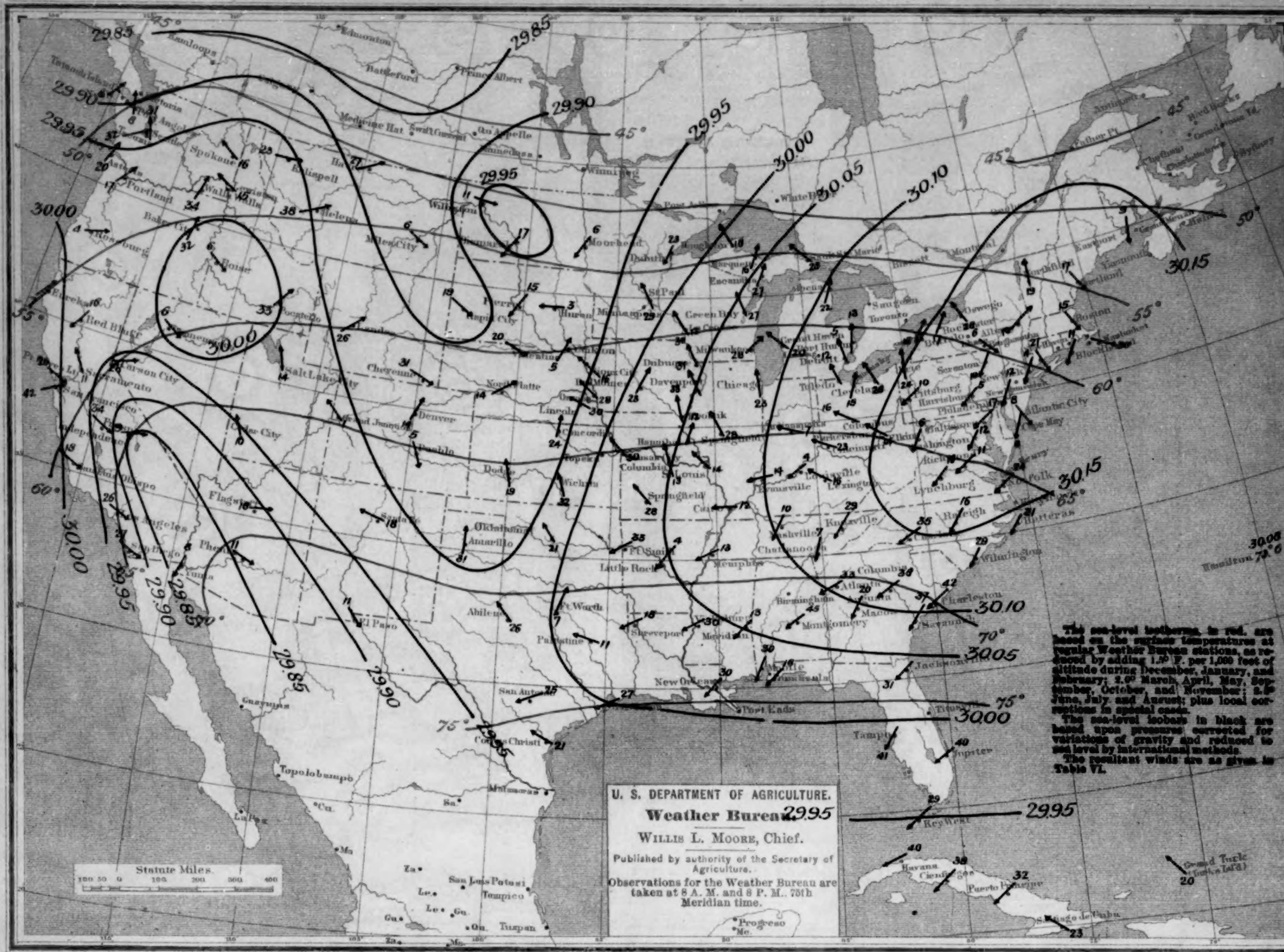

Chart V. Hydrographs for Seven Principal Rivers of the United States. October, 1900.

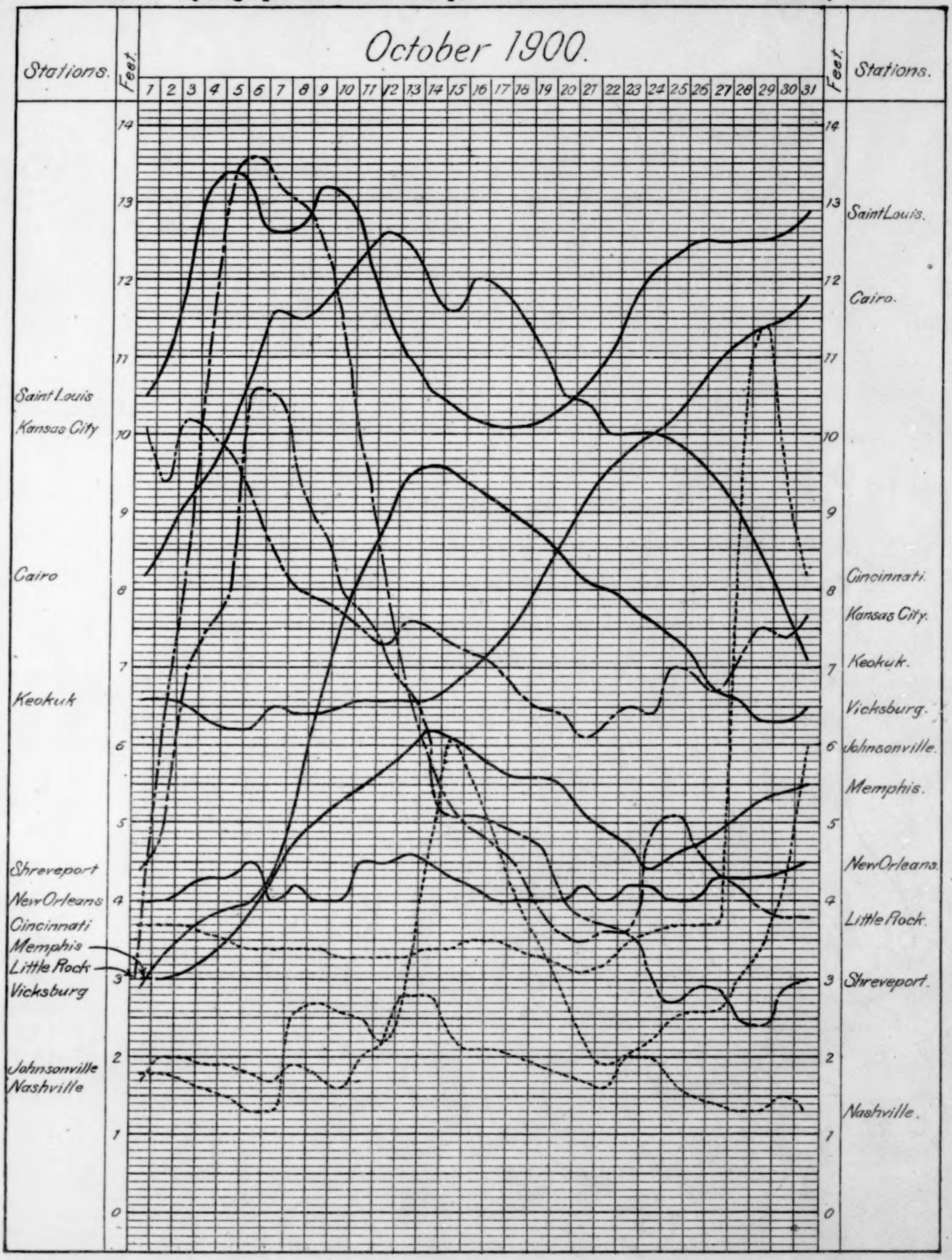

Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. October, 1900.

Chart VII. Percentage of Sunshine. October, 1900.

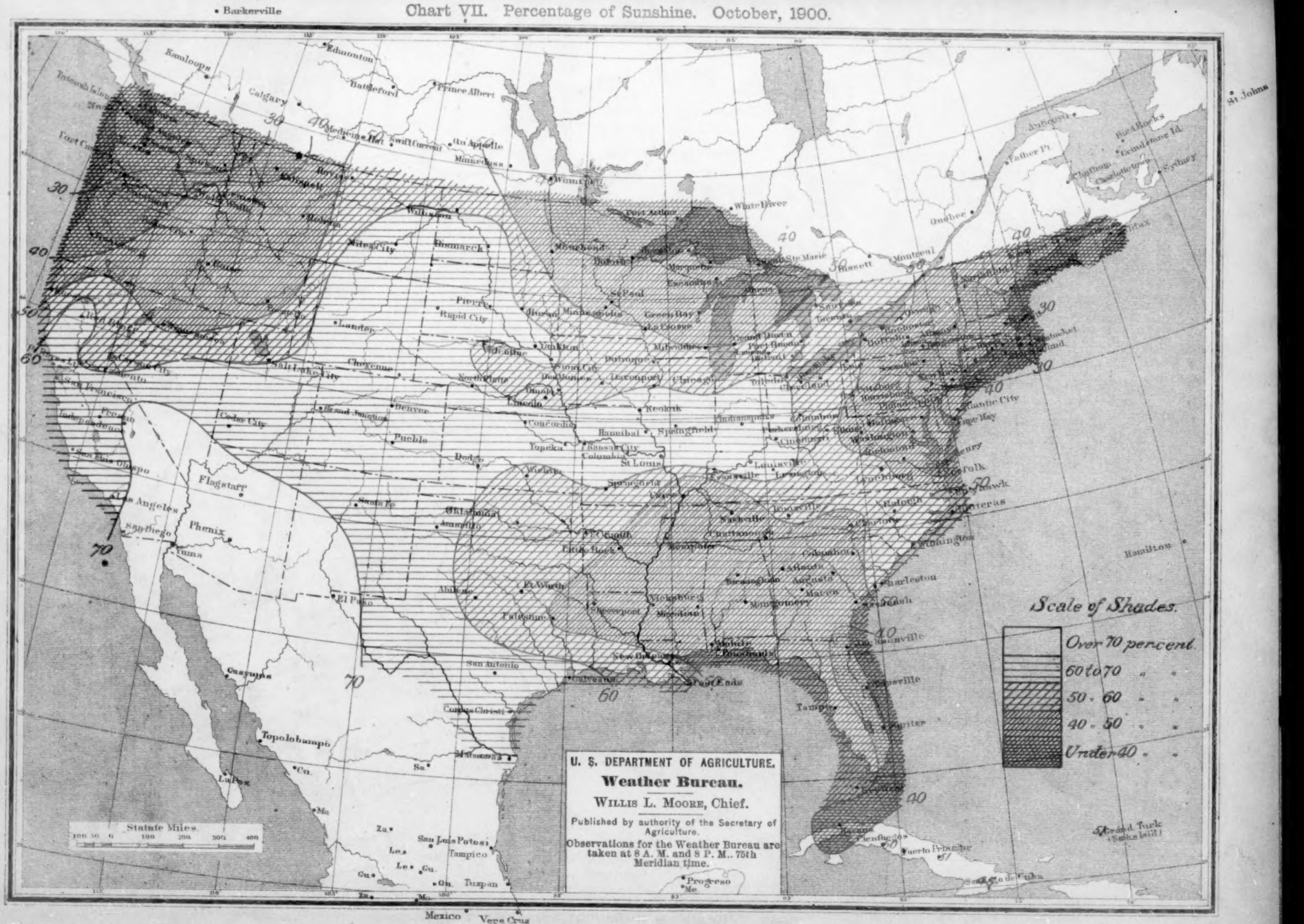

Chart VIII. Total Snowfall for October, 1900.

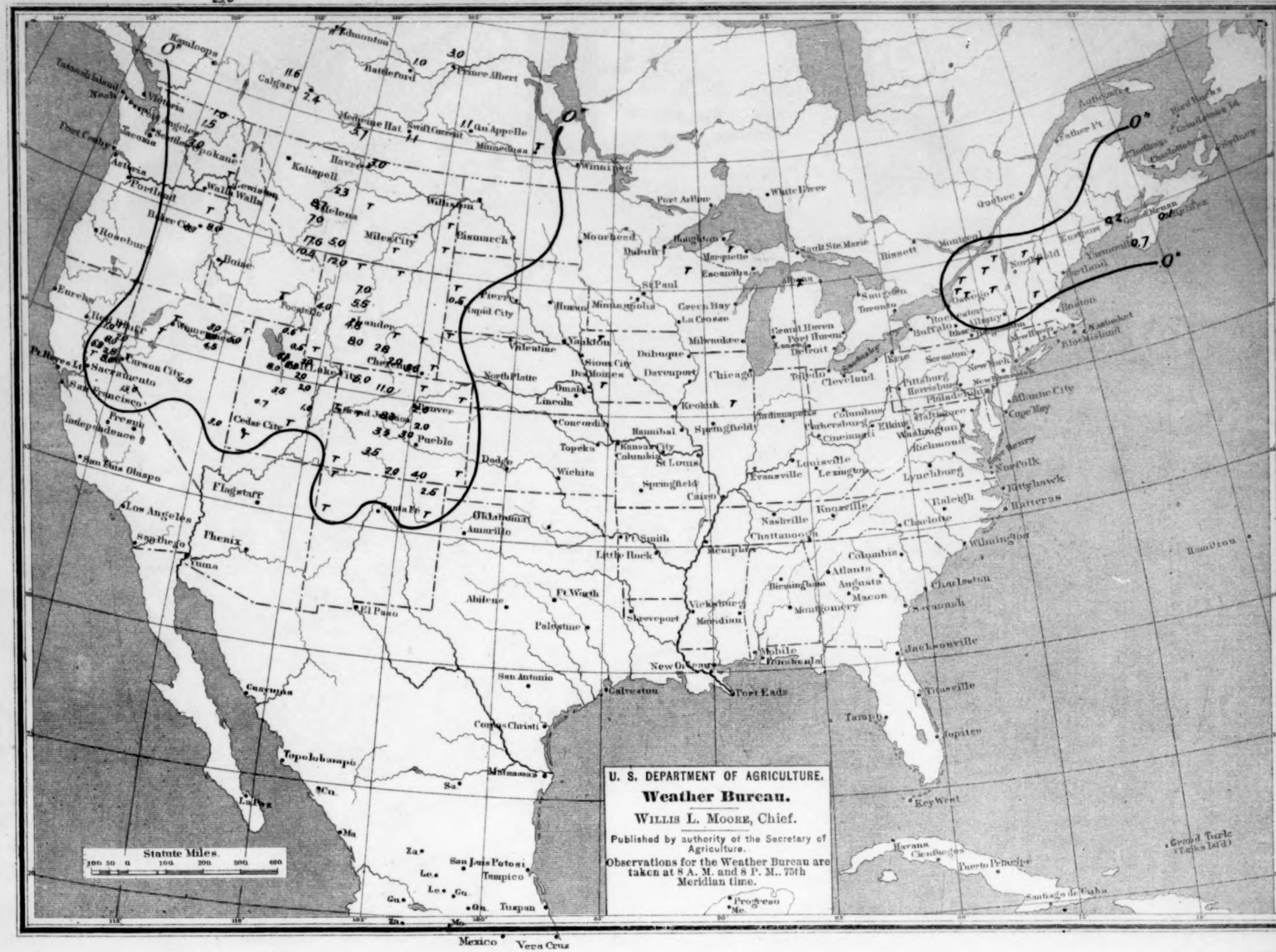

Chart IX. West Indian Monthly Isobars, Isotherms, and Resultant Winds. October, 1900.

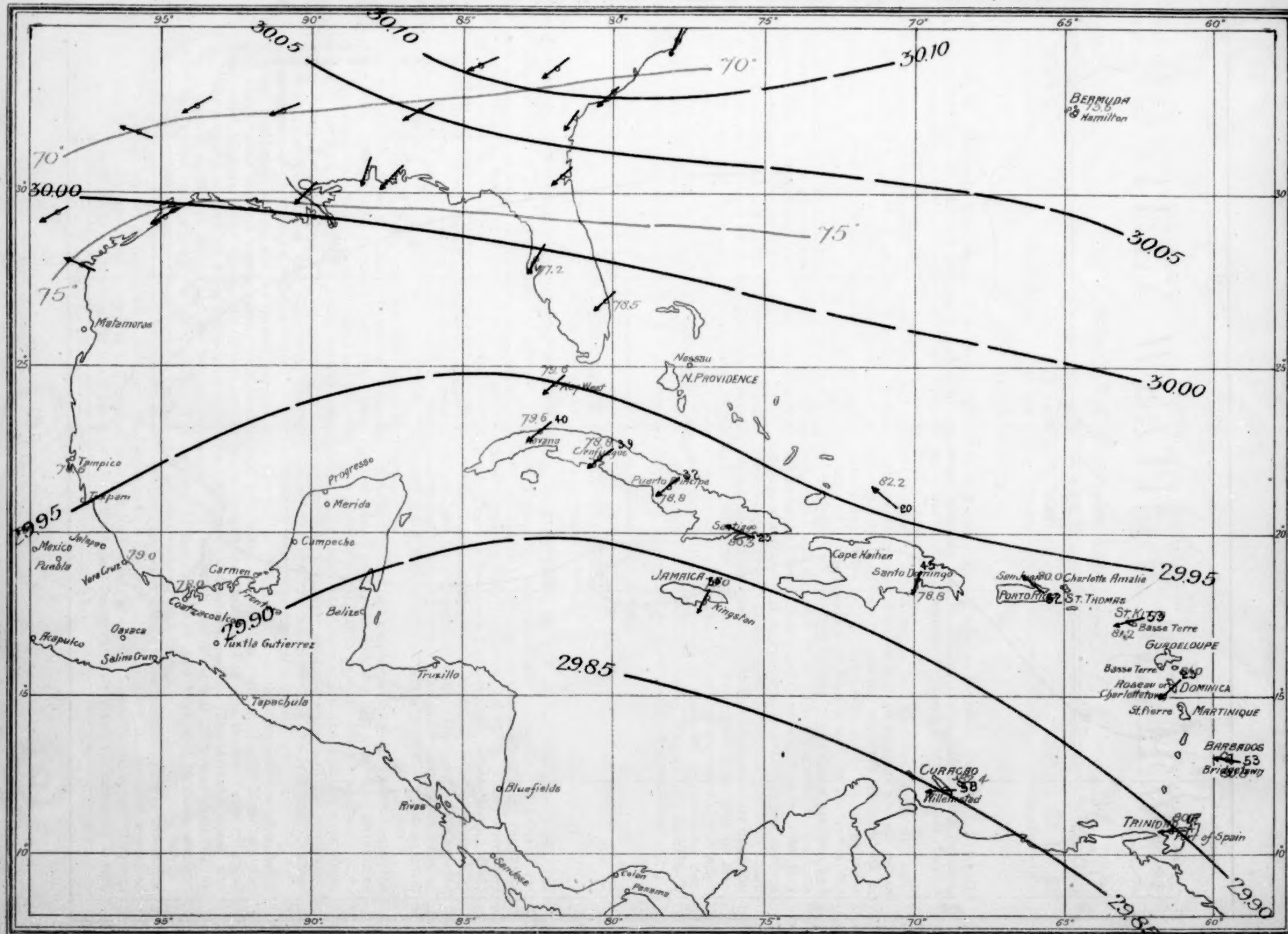

Chart X. Track of the Porto Rican Hurricane from August 3 to September 7, 1899.